

# A 50 Watt W-band MPM

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**Abstract:** BVERI has developed a wide band microwave power module (MPM) providing over 50W RF power from 91GHz to 97GHz. The MPM includes a folded waveguide CW TWT, a modular electronic power conditioner (EPC) and a solid state amplifier (SSA) with a gain equalizer.

**Keywords:** MPM; Microwave Power Module; TWT

## Introduction

In recent years, several works of W-band airborne system were demonstrated such as high resolution radar [1] and wireless military network. To address these needs, BVERI has developed a new MPM taking its advantages of high integration and wide band into account.

Figure 1 shows the prototype of MPM. The dimensions of MPM are 390mm x 180mm x 45mm (including power supply connector), and its weight is 6kg. The output power test data shows in Figure 2. With 1mW nominal input, the MPM can provide 50W output power from 91GHz to 97GHz. In order to cover various applications, the MPM can work in both pulsed mode and continuous wave mode, controlled by an external signal. Both modes have the same amplification characteristics.

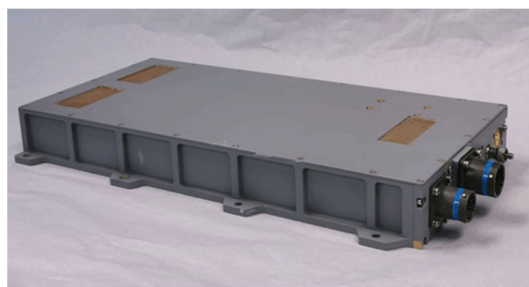


Figure 1. The prototype of W-band MPM

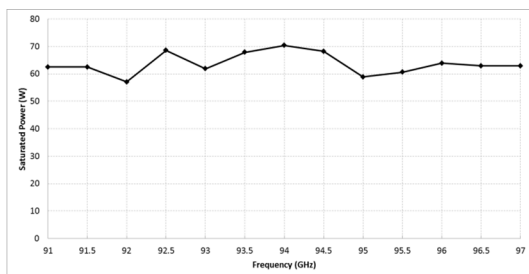


Figure 2. MPM output power with 1mW nominal input

## Traveling Wave Tube

Building on the 4GHz operating bandwidth TWT [2], BVERI has developed a TWT providing 50W around 94GHz with 6GHz bandwidth for MPM. The TWT using folded waveguide and ppm focusing system operates at a voltage of -16.5 kV and current of 75mA. A focus electrode is used to modulate the electron beam. As the final stage amplifier of the MPM, the TWT shares the same RF saturated output power with the MPM as shown in Figure 2. Figure 3 and Figure 4 display the saturated gain, electron efficiency and overall efficiency data of the CW test. Among the 6GHz operating bandwidth, the minimum saturated gain is above 34dB and the electron efficiency is among 4.6% to 5.6% while the overall efficiency is within 16- 20%.

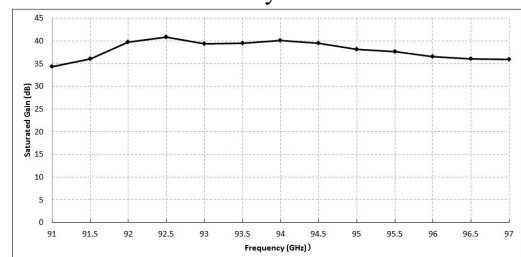


Figure 3. TWT saturated gain

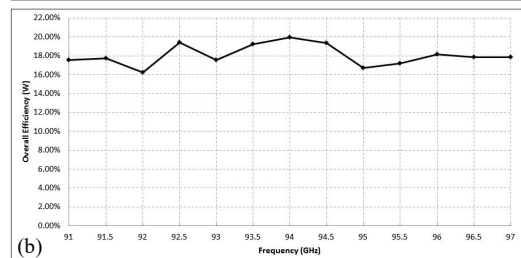
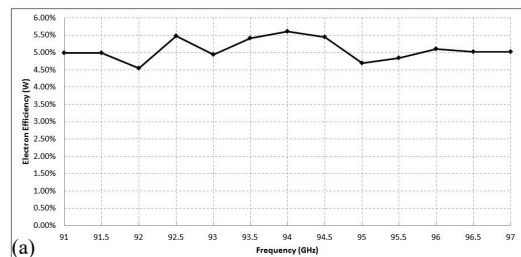


Figure 4. (a) TWT electron efficiency; (b) TWT overall efficiency

## SSA

University of Electronic Science and Technology of China developed the SSA. The SSA can provide maximum 45mW output power to drive TWT. In order to decrease the saturate gain ripple of RF chain, a gain equalizer is integrated between SSA and TWT. With utilizing the gain equalizer, the MPM can operate at 1mW nominal input power and output 50W min power within the operating frequency.

## Electronic Power Conditioner

Southwest China Research Institute of Electronic Equipment developed the EPC. Utilizing an input power format of 270VDC, the EPC is capable of providing to 400W of prime power to operate the TWT. Additionally, the EPC includes an auxiliary supply, which can provide 10W power to operate the

other components of MPM such as SSA. The overall EPC efficiency is exceed of 90%.

## Conclusions

BVERI has developed a new W-Band MPM providing 50W output power around 94GHz with 6GHz bandwidth.

## References

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