

Specifications for a W-band (94GHz) Amplifier

1. Introduction

This specification is for a medium power 94 GHz amplifier that can be used to drive a high power final radar amplifier or it can be used alone as the final amplifier in a short range pulsed radar system. The requirements satisfied by these specifications can be met with modified extended interaction klystron (EIK) model VKB2475L and power supply modulator VPW3493 from Communication & Power Industries or equal.

The required modifications enable the amplifier to be used with longer pulse widths than the standard model. The amplifier will meet the specification of the standard model but have a capability to be user configured to operate with longer pulse widths. This performance specification highlights the key requirements and defines the modified performance.

2. Performance

Frequency range	93.5 to 94.5 GHz	min.
Instantaneous Bandwidth (1.5 dB)	800 MHz	
Peak output power	1000 Watts	note 2
Gain	43 dB	min.
Drive power to saturate	50 mW	max.
Pulse duty cycle range	0 to 10 per cent	
Pulse width range	0.1 to 50 microseconds	note 2
PRF range	0 to 80 kHz	
Phase and amplitude stability		note 3

Note 1. For operation with pulse widths greater than 20 microseconds the peak output power must be greater than 500 Watts.

Note 2. The combination of pulse width and PRF will not exceed 10 per cent duty. A reconfiguration of the amplifier may be required to obtain pulse widths greater than 20 microseconds.

Note 3. For a constant frequency, pulse amplitude must not droop at a rate greater than 1 db per microsecond from the start to the end of the pulse. Pulse-to-pulse, the amplitude difference must be less than 1 dB. The phase must not change by more than 3 degrees per microsecond from the start to the end of the pulse. The phase difference pulse-to-pulse must be less than 5 degrees.

3. Operating conditions

Load impedance	1.2:1 VSWR operating, 1.5:1 no damage
Temperature Range	5 to 40°C
Prime power	220 Vac 60 Hz

4. RF interface

RF input and output	WR 10 waveguide flanges
Output monitoring 30 dB dual directional coupler	WR10 waveguide flanges

5. Modulator and control unit

The pulsed modulator and control units must be in a rack-mounted unit and provide suitably regulated voltages to operate the EIK within the performance specifications. Means must be provided to monitor and adjust all critical currents and voltages. Inputs must be provided for modulating pulse inputs and an external interlock to disable the modulator. Fault protection functions will be incorporated to protect the EIK from power supply faults as well as input pulses that exceed duty cycle or pulse width limits.

5.1 Switching time An external modulating pulse must turn the EIK beam on and off with the following requirements: The beam must be fully on less than 200 ns after application of the pulse and the beam must be off less than 300 ns after the pulse is removed.

5.2 Controls The control unit must provide an internal means for testing the modulator and amplifier in the absence of the external modulating signal input. As a minimum the following control function must be incorporated:

- Modulator prime power switching
- Filament voltage on / off control
- High voltage on / off control
- Pulse voltage on / off control
- Internal / external pulse selection
- Internal pulse width and PRF adjustment

5.3 Indicators The following status indicators or monitoring points must be provided:

- Filament delay / ready
- Modulator ready
- Transmitter over temperature
- Modulator faults
- Power supply temperature
- Cathode voltage
- Collector current
- Body current

6. Documentation An operating and instruction manual must be provided that contains the theory of operation, installation procedures, operating procedures, troubleshooting procedures, block diagrams and schematics of the modulator and control unit.

7. Acceptance test An acceptance test procedure must be provided prior to delivery and an acceptance test performed prior to delivery. Representatives of the Naval Research Laboratory may witness the acceptance test.