Continuous Wave Single Mode High Power Fiber Laser

1) Description of Technology :

LASTEC has developed 1 kW Single Mode Fiber Laser, an all fiber configuration without any external bulk optics. The laser has been developed using a LMA (Large Mode Area) Yb^{3+} doped fiber with suitable core radius and inner cladding radius. Fiber length is optimized for the gain and output power. Fiber laser resonator is formed by two FBGs (Fiber Bragg Gratings), one at pumping end with high reflectivity and other at output coupler side. The fiber is pumped by high power laser diodes emitting through appropriate pump combiner. Output of this laser is extracted through output coupler into a high power fiber connector assembly.Absorption band of Yb doped active fiber is very narrow at 976 $\pm$ 0.5 nm while it is very broad at 915 $\pm$ 15 nm. Thermal management for laser diodes at 915 nm is very relaxed compared to 976 nm. Gain and quantum efficiency of Yb doped active fiber at 976 nm is higher compared to 915 nm. Therefore laser diodes operating at optimum wavelength were chosen for pumping.Active fiber also requires proper cooling for optical conversion. Pump combiner are propagating large pump power, therefore need to be cooled very efficiently. All these require very efficient specially designed cooled platform. Unabsorbed pump power will always remain in such laser system. Pump dumps are designed for removal of these unabsorbed pump power, which otherwise can damage the delivery fiber or degrade the beam quality of fiber laser.Single Mode Fiber Laser is operating at 1075$\pm$10 nm with spectral linewidth of 5 nm and achieved very good beam quality of M^2 value less than 1.2.

2) **Application Areas :**Main application is Laser Ordnance Disposal

The photograph of 1 kW Continuous Wave Single Mode Fiber Laser which is developed at LASTEC is given below.

3) USP Certification/ Results :

Parameter	Achieved
Power	1008 W
Beam Quality	M^2 = 1.2
Wavelength	1070 nm
Optical to optical efficiency	>70%