

# **DEVELOPMENT AND FABRICATION OF LASER HEAD FOR LASER CUTTING MACHINE**

**This is presented in partial fulfilment for the award of the  
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# ABSTRACT

This report describes the development and fabrications of high-power pulsed red ruby laser gun. This laser system is to be used as a laser cutting machine.

Ruby laser belongs to solid-state lasers. This system is pumped optically by the use of xenon flash lamp. The cooling system consist of circulated air from outside provided by a fan.

The system developed are intended for a laser rod with the integral mirrors coated on the ends. The flashlamps are operated with voltages generated from a power pack. The Ignitor supplies high voltage pulse of over 10 kV. In future, with the aid of suitable lenses, the focusing or collimating of the laser beam can be done for variable applications.

Testing of power pack and laser head were conducted at various critical points to ensure the required performance. The test were conducted in stages, i.e. in sequence before proceeding to the next stage. As such the final performance can be predicted and also as a reference for troubleshooting failure, if any, in future.

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# 1.0 Introduction

Technically, a laser is a device for producing an electromagnetic radiation, similar as light, but of higher radiant energy. The word "Laser" is an acronym derived from "Light Amplification by Stimulated Emission of radiation", and is generally used in referring to the radiation of the device that produces the laser.

Laser radiation can be produced in the spectral ranges from ultra violet, through visible, to infrared radiation. The laser generator is an optically active medium confined in an optical cavity placed between two reflecting surfaces.

The generated light oscillates in this cavity and becomes amplified by the cumulative increase of the light by reflection between the reflectors. The amplified light possesses the characteristics of a monochromatic radiation, high radiant intensity and directionality. It is projected through air or space in a pencil beam. The lasing medium may be gas, a solid or a liquid.

Ruby laser is one of solid-state lasers. Ruby belongs to family of gems and is made of Aluminium Oxide (sapphire) containing about 0.05 % Chromium (Cr) . The red in colour of the ruby is caused by the percentage of the impurities (chromium).

Basically, ruby laser system consist of a ruby rod, a flash lamp which is housed together with the rod in the same container (metal foil), a cooling system and a power supply with capacitor banks.