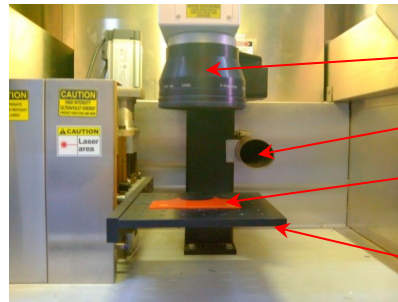


## Laser Engraving System



Focusing lens

Exhaust pipe

Substrate

Vertically  
Movable stage

Laser Engraving specifies a broad category of surface modification (physical or chemical) with a variety of applications. It consists of a high power laser beam that is used to print/engrave a given surface. The laser beam is focused using a high quality lens to fall vertically on a substrate that is placed on a vertically movable stage. The vertical position of the stage is automatically adjusted such that the upper surface of the substrate falls at the point of focus of the focussing lens. A computer software is used to control the motion of the laser beam parallel to the plane of the substrate such that it can print/engrave on the substrate depending on a design that is fed.

### Laser Specifications:

Laser type	Nd:YAG Solid State UV Laser
Wavelength	355nm
Pulse width	~10 nanosecond
Laser beam spot size as the focused position	~20 microns
Pulse energy	Upto 1 mJ
Energy per unit area	320 J/cm <sup>2</sup>
Power per unit area	32 x 10 <sup>9</sup> W/cm <sup>2</sup>
Work area	Less than 4 cm x 4 cm

### Parameters that need to be controlled for a given pattern and substrate:

- Current
- Pulse repetition frequency
- Speed of the laser beam
- Position of the substrate with respect to the point of focus of the lens
- Number of passes

### Software:

- The command is fed in BeamConstruct software which is specific to the machine.
- The designs can be imported in the form of .dxf files. These files can be made in softwares such as AutoCAD (in our case, .dxf files compatible with AutoCAD 2007) or Clewin.

### Applications tried using our machine:

- Cutting through-and-through patterns in PET sheets (or transparency sheets). Thickness ~50µm.
- Cutting through-and-through patterns in Polycarbonate sheets. Thickness ~1mm.
- Cutting through-and-through patterns in paper and cardboard sheets. Card board sheet thickness ~1mm.
- Engraving acrylic sheets. Thickness ~5mm.
- Cutting/Engraving 2 inch Silicon wafer of thickness ~275µm.
- Making holes in glass cover slips of thickness ~150µm.
- Engraving microscope glass slides ~1.98mm.