



Gyrotron Technology, Inc.

# GYROTRON GLASS SHAPING TECHNOLOGIES

Confidential

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[gyrotrontech.com](http://gyrotrontech.com)



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## About the Gyrotron Beam

# What is the Gyrotron beam?

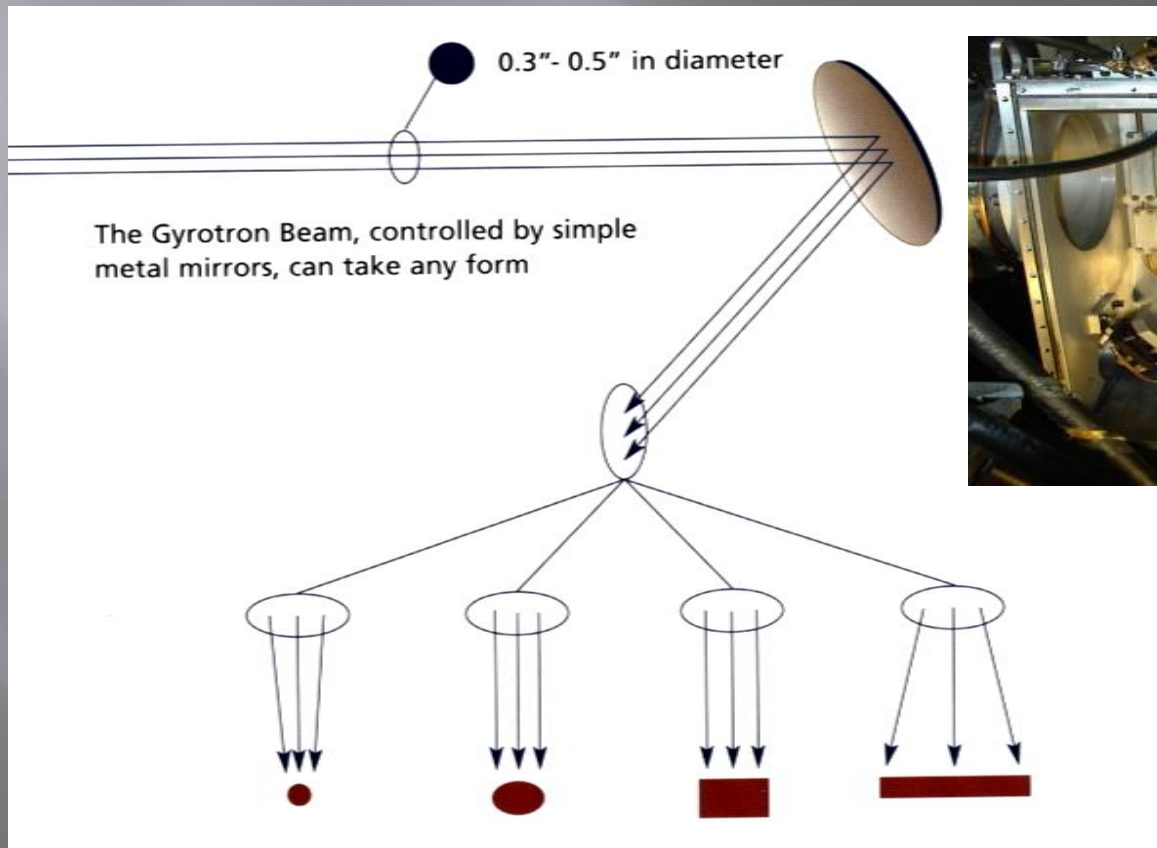


**The Gyrotron Beam is a new industrial heat source. Allows heating:**

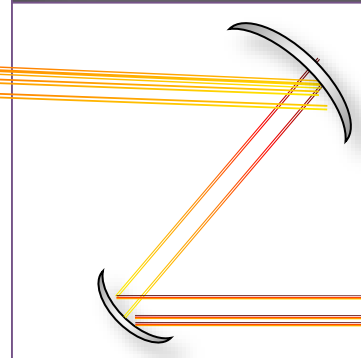
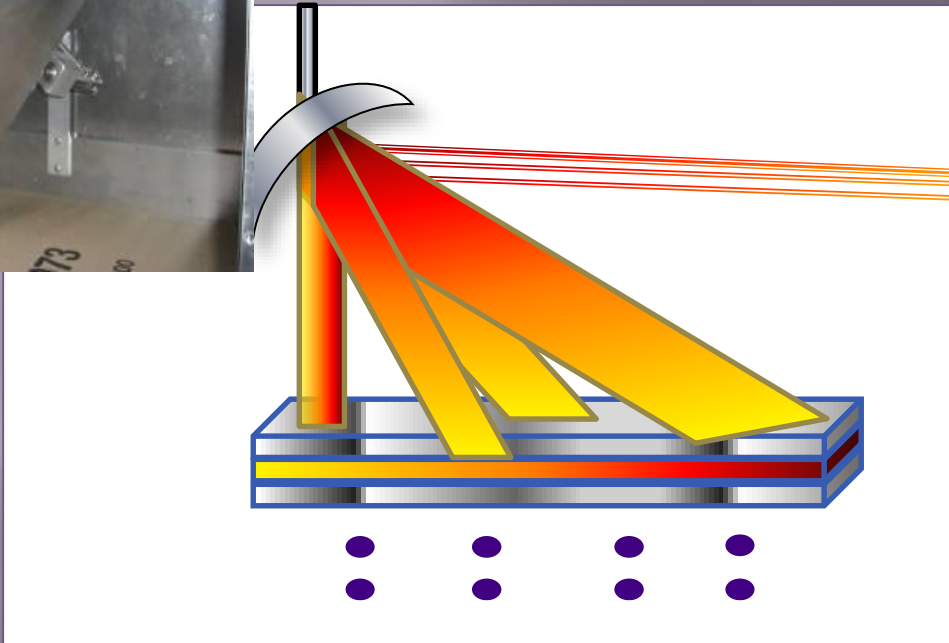
- Ultra rapidly, with heating rate thousands of degrees per second large or small objects;
- To any temperature up to over 3,000°C with high repeatability and accuracy better than 1%;
- With precise and controllable temperature distribution.

# Shaping the Gyrotron Beam

The beam can be shaped into any form – circular, strip, square, etc by using simple metal mirrors

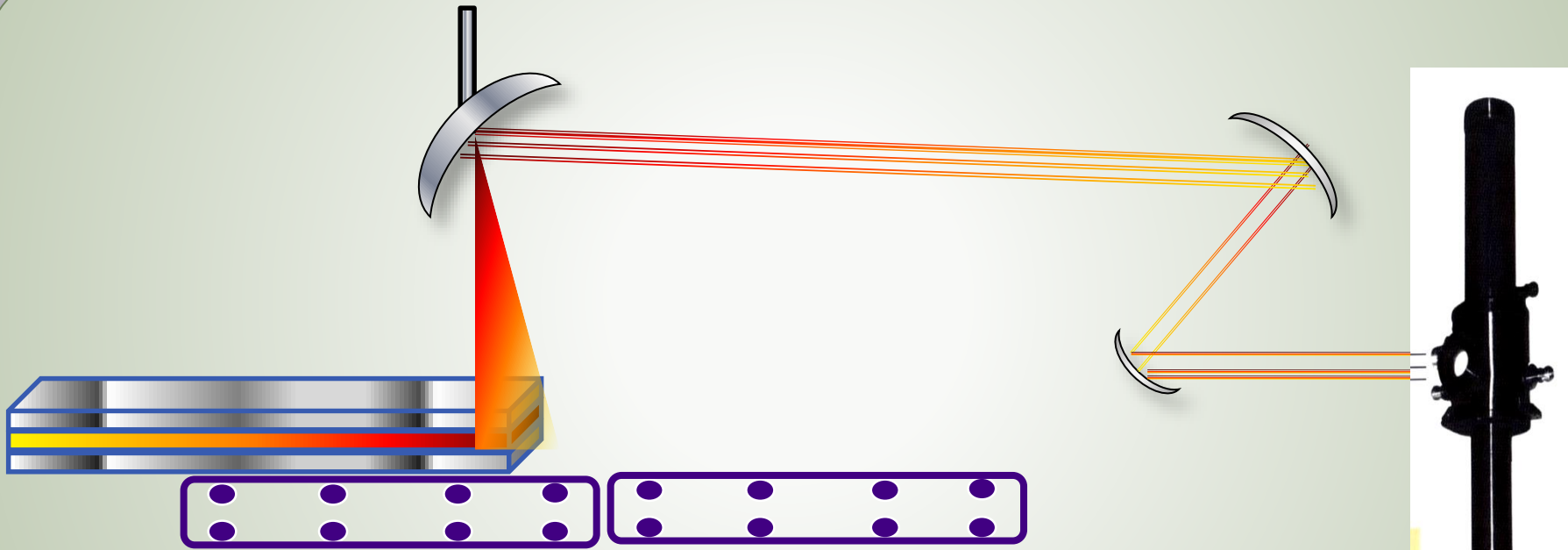


# It Can be Scanned



The beam can be scanned to heat selected areas to selected temperatures using a configuration of moving mirrors

# Heating Options - Ribbon



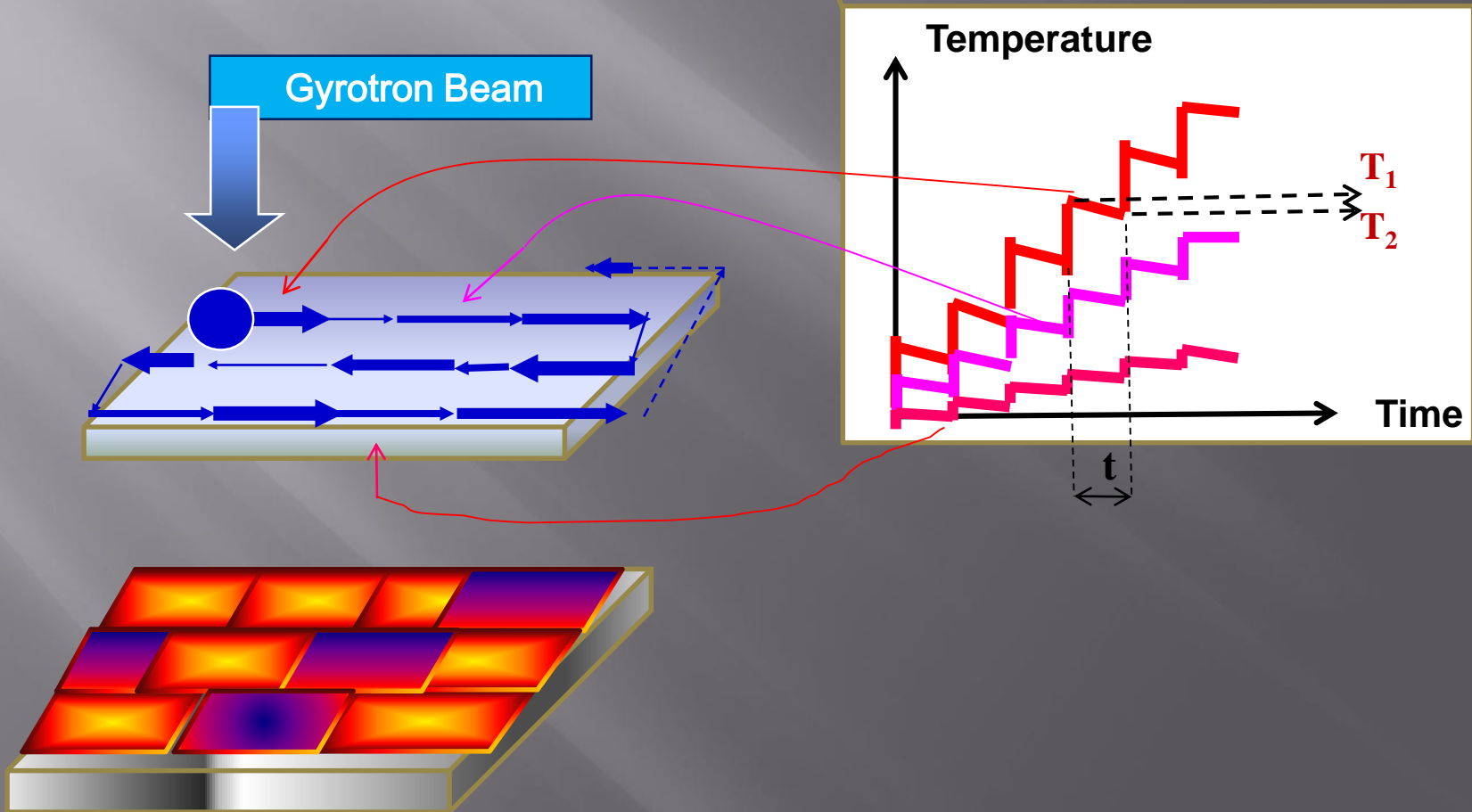
The beam can be formed into a ribbon shape and product can be rapidly conveyed through a stationary beam, or ribbon can be moved.

# GYROTRON GLASS SHAPING TECHNOLOGY



# Non-Uniform Glass Heating

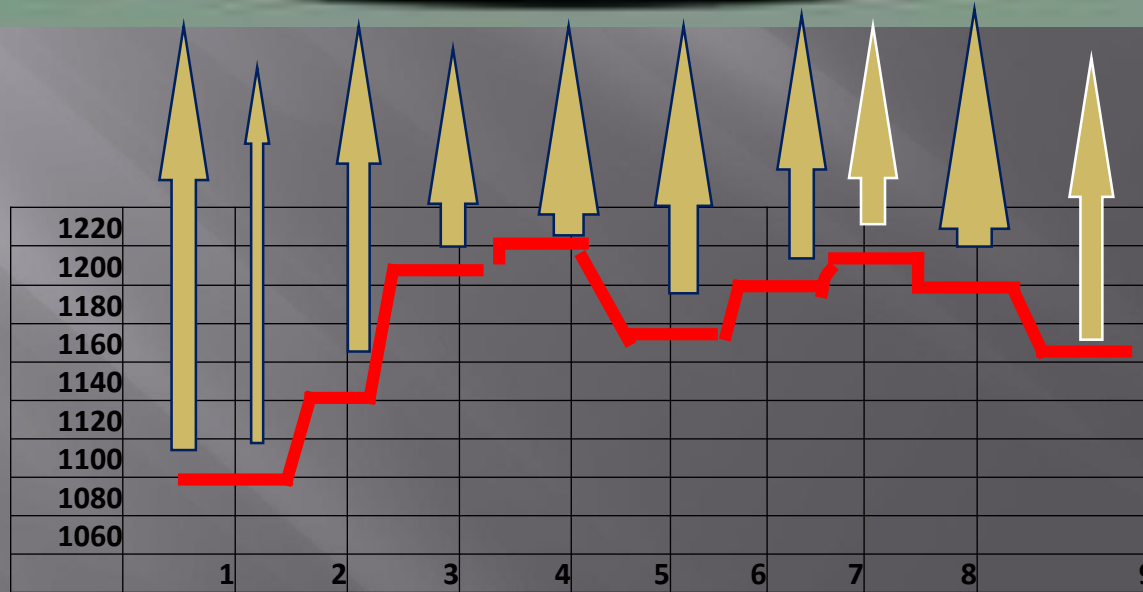
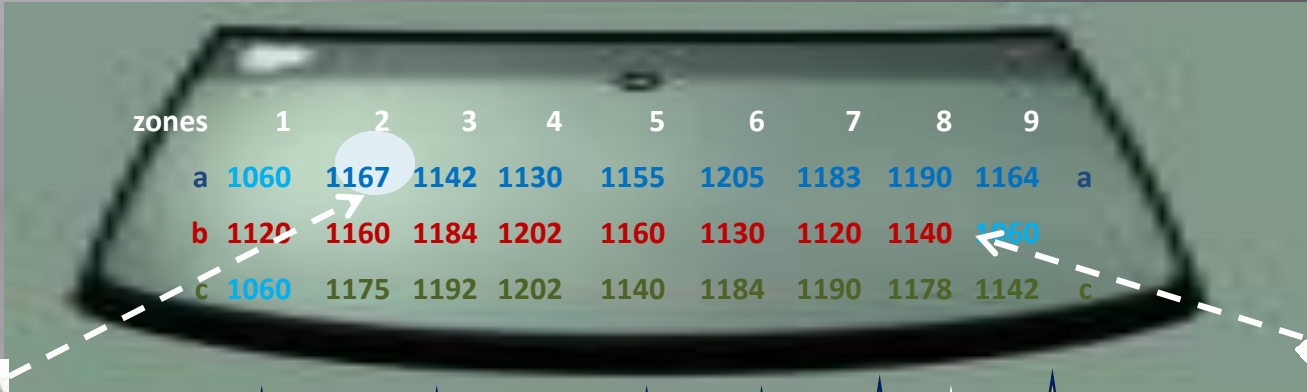
If the beam velocity is variable during scanning, heating will be greater where beam is slow moving and less in the areas where the beam passes quickly





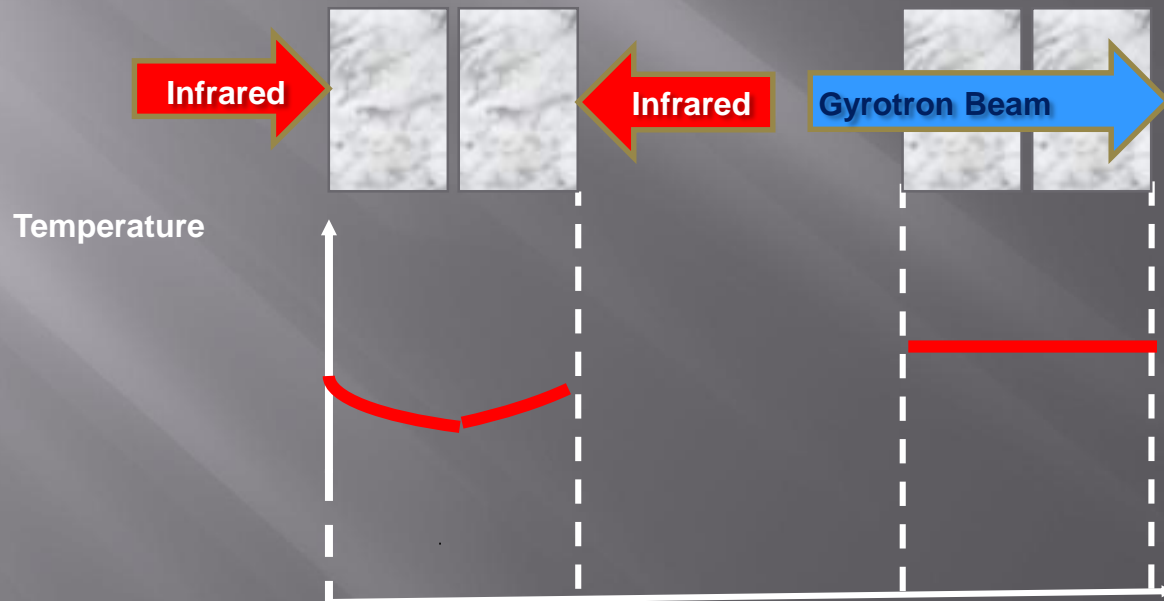
# Gyrotron Beam Shaping Windshields

The temperature distributions necessary for shaping the glass sheet can be realized by scanning the gyrotron beam non uniformly. This distribution can be corrected during processing (by changing beam speed and power) through temperature control by pyrometers



# Heating Glass Plies

Compared to infrared or gas heating the gyrotron beam can provide uniform temperature distribution through the thickness of two glass sheets (doublets). This eliminates gap in case of shaping doublets and reduces the temperature that is needed to shape glass. As a result, distortion is reduced by over 70%.



# GTI Gyrotron Shaping Advantages

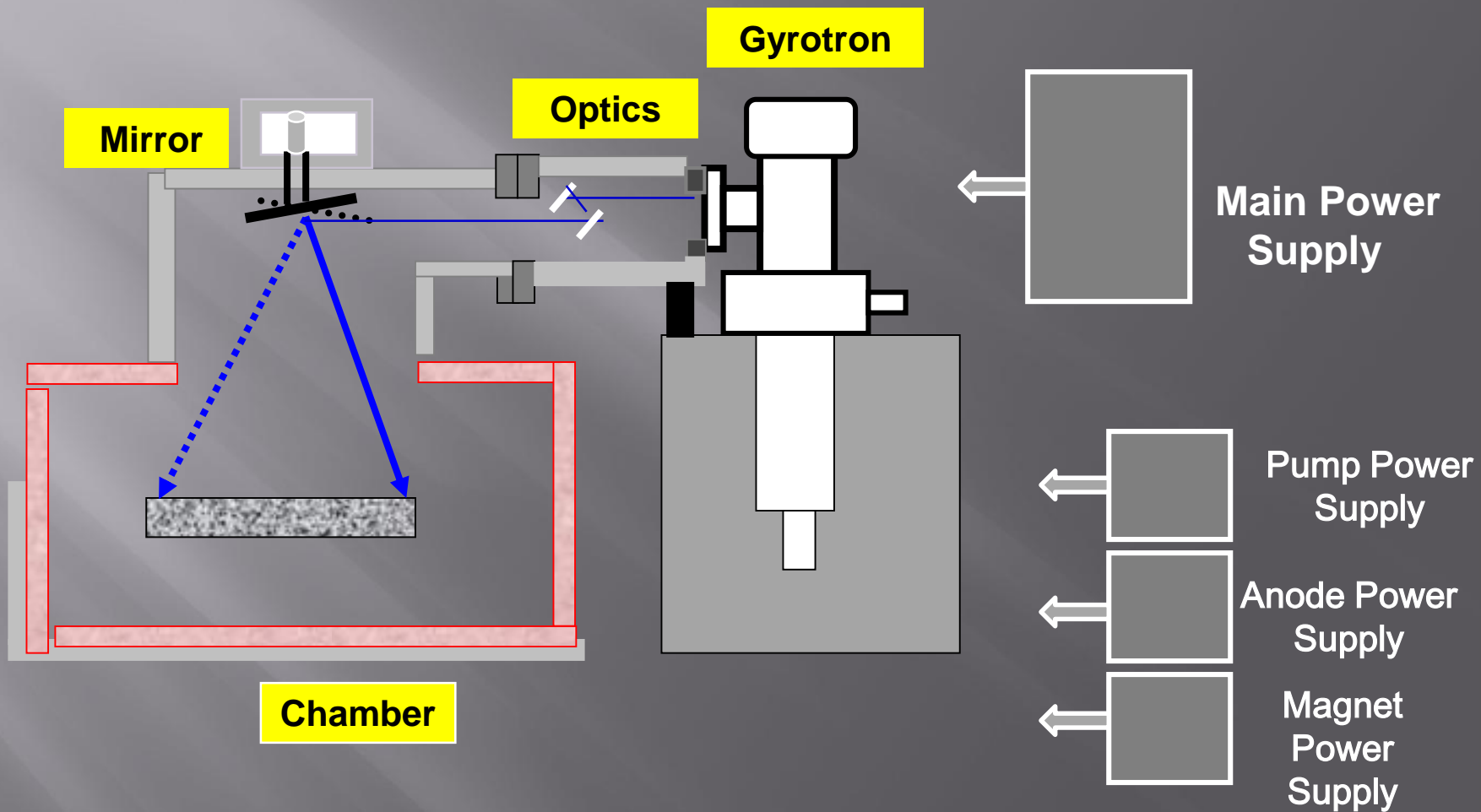
## **Advantages include:**

- **achieving complex geometries**
- **higher quality output (lower distortion)**
- **no-gap doublet bending**
- **lower production costs (tooling, labor, energy)**
- **frit/ceramic inks can be fired while bending**

**The gyrotron system can be retrofit into old bending lehrs**

# Gyrotron Equipment Set

# General Installation Layout

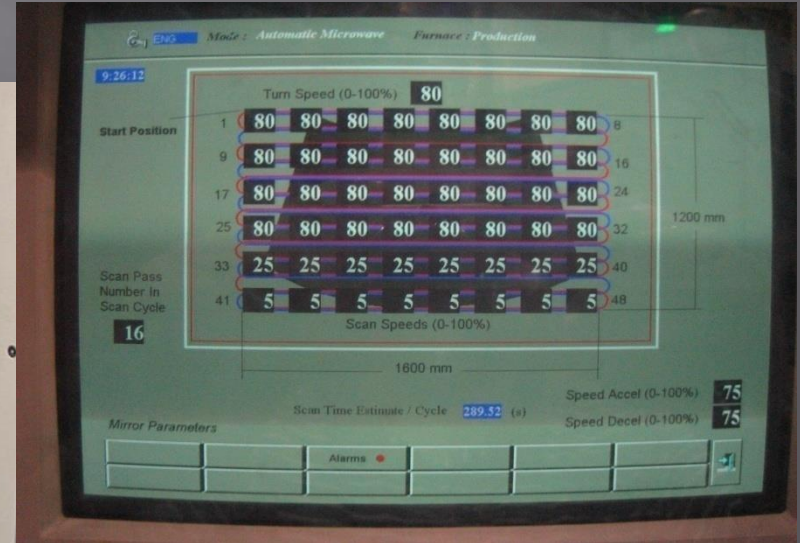


# Gyrotron with Liquid Helium Free Magnet



**Length – 2m,  
Weight – 200kg (with magnet)  
Product life - over 10 years**

# Installation Parts: Control Panel



Example of display

The gyrotron control elements installed in existing control station