

## AN2621: Dual Axis Germanium AO Deflectors

### The Polarization Challenge

In theory, a pair of Germanium AO deflectors can be configured for 2D, X-Y scanning of CO<sub>2</sub> laser beams.

Germanium AO devices require linear polarized input light. For X-Y applications, polarization rotation is required between the X and Y axis. This could be achieved using a half waveplate. However, Isomet have not found an affordable waveplate solution that can withstand high CW optical powers.

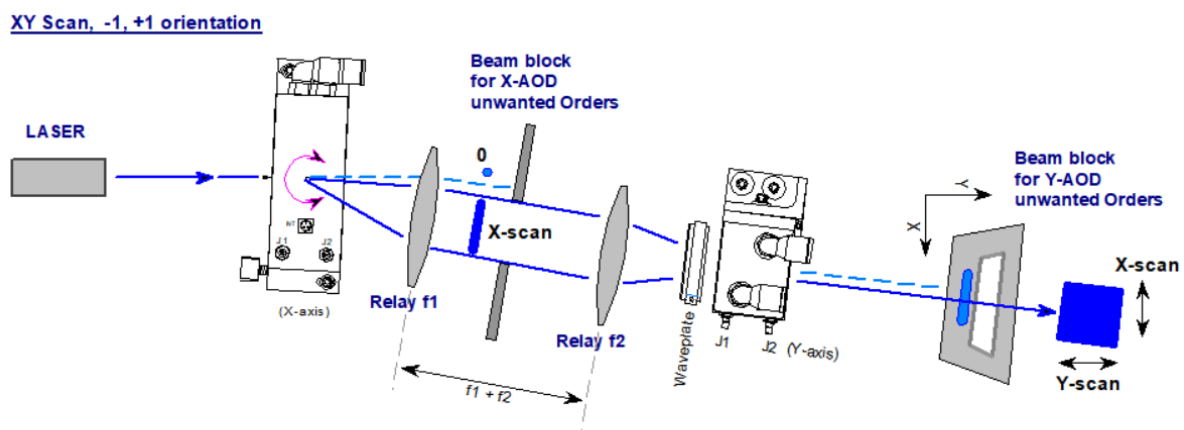
II/VI did offer CdS waveplates, but the cost is now prohibitive.

At the time of writing, a 12mm aperture half waveplate costs over USD10,000 each.

It is advantageous to separate the X and Y axis AODs at high powers.

It allows the zero and unwanted orders from the input AOD to be blocked before the entering the orthogonal AOD.

The principle is shown in the simplified schematic below (for clarity, simple waveplate shown).



### Other High-Power Considerations:

- There are two thermal challenges with all Germanium AO devices. Both can cause thermal lensing effects.

#### 1: Optical absorption

As a rule, the optical absorption in Germanium is ~1.8%/cm path length.

The minimum path length for use in 8 -12  $\mu\text{m}$  range is ~2cm per AOD.

#### 2: Heat generated from RF drive power dissipation.

For pulsed laser applications, the RF drive power can be gated around the laser pulse, and this reduces the average RF drive power and thus thermal load.

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Note: Increasing the active aperture height increases the RF driver power in proportion.

Thermal lensing is usually the limiting factor before laser damage occurs.

- LIDT  
Pulsed =  $7\text{J}/\text{cm}^2$ ,  
CW =  $125\text{KW}/\text{cm}^2$

Increasing the beam size will reduce the optical power density but will increase the AO scanning response time and RF drive power (if the active aperture is increased).