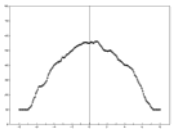
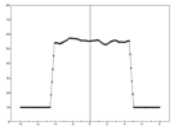
HY120 Beam Shaper for Excimer Lasers





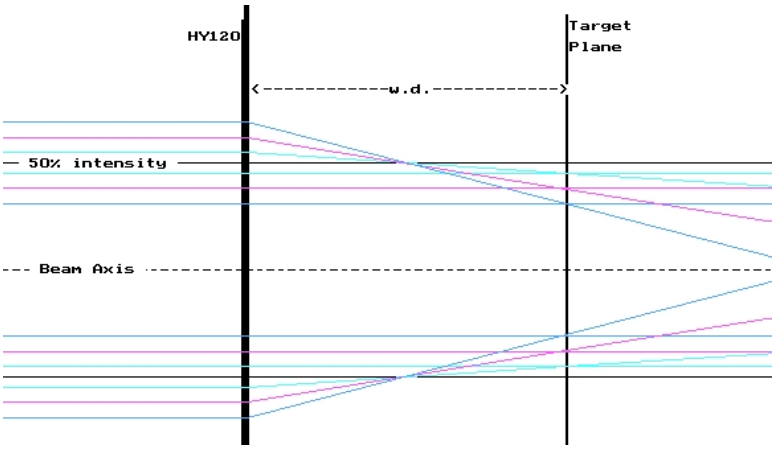
Typical excimer lasers emit a beam whose profile if often described as 'quasi-Gaussian', though in reality it has no well defined mode structure, and low coherence. An excimer laser might more accurately be called a UV flashlight.

Whereas most materials processing applications require uniform treatment, and require a beam having the so-called 'top-hat' profile.

Optec HY120 Beam Shapers convert the raw excimer beam into the desired top-hat form.

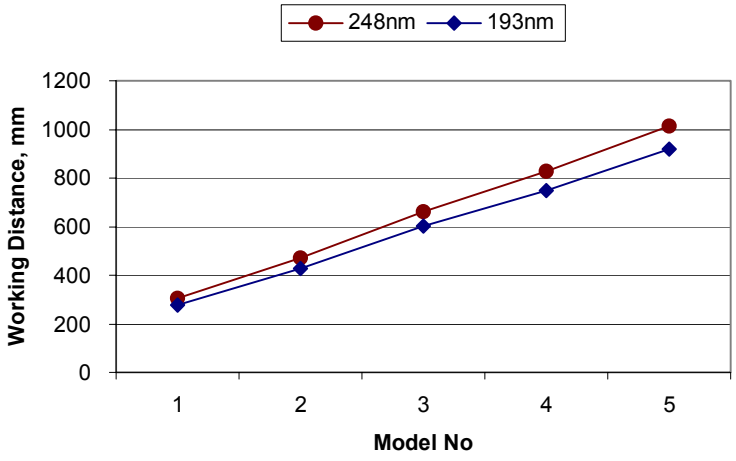
The HY120 works by taking energy from the weak flanks of the beam where intensity is less than 50% of that in the centre, and folding it back into the beam to boost the beam intensity where it falls towards the 50% level. Correctly adjusted, the result is a beam on the target plane with uniform intensity over a rectangular area corresponding roughly to the original 50% power points.

The ray tracing in one axis is shown, lateral scale expanded 25X:-



On each side of the beam, marginal edge rays from the edge of the beam are brought to a line focus using specially cut cylindrical elements. Further down the beam path, at the working distance w.d. these rays ADD to the main beam in the centre, to produce the top-hat profile. W.d. is not critical, and the final corrected profile changes very little over several tens of mm.

Each of the four cylindrical elements has a precision micrometer screw so that HY12O can be adjusted to suit the input beam.



FIVE different models are available, with varying working distance. In general, as w.d. is decreased, the top-hat correction improves, but angular divergence of the edge contributions increases, the latter has to be matched to downstream optics.

1=300mm; 2=450mm(most popular model)
3=650mm; 4=800mm; 5=1000mm

Consult Optec for other w.d. for custom apps.

HY120 can do nothing about a beam with hot-spots, or a hole in the middle. It does make an excellent job of generating uniform intensity,- +/-5% or better,- from a reasonably well-behaved input beam. HY120 has proved invaluable in improving profile on ageing lasers where electrode erosion has broadened the beam, and in putting 'lost' energy to work in a wide range of excimer processing applications. Use your photons!

Since the main part of the beam does not pass through any optics at all transmission efficiency is on the order of 98%, uncoated optics are fitted as standard for complete wavelength interchangeability. Inherent high efficiency makes the device doubly attractive at short wavelengths, 193nm & 157nm, where optics performance is poor.

STOP PRESS:- HY120/DUV now available in sealed version with CaF2 optics for those delicate 157nm photons. Don't lose them,- use them!

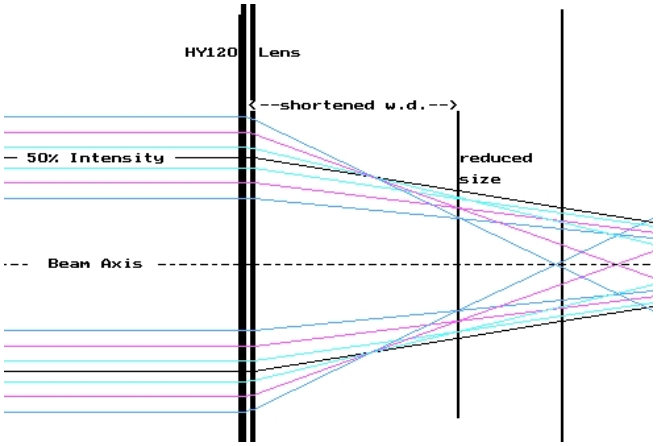
Setting up the HY120

- Use the micrometer screws to fully retract the four elements, and centre the device on the beam with suitable mount. There are M6 tapped holes in each side of the device to aid mounting.
- Advance each element in trun, checking with fax paper or glass slide at approx. HALF the nominal working distance. Adjust each element until the line focus is clearly seen, with a dip in intensity beween the line and the beam centre. (If the beam is too big or small to make this adjustment, open the device and reposition the optics mounts on their sliding carriers.)
- Adjust the four elements so that the line foci are of similar intensity
- Make fine adjustments by checking profile in the target plane. Remember there are FIVE variables, the adjustment of each cyl. element, and the position(w.d.) of HY120 w.r.t. to target plane.
- Depending on input profile, it can happen that optimum w.d. is different in H & V axes. Separate the two modules, and set each one at the optimum position w.r.t. the target plane. In some special cases, different f.l. elements are used in H & V axes, consult Optec for details.

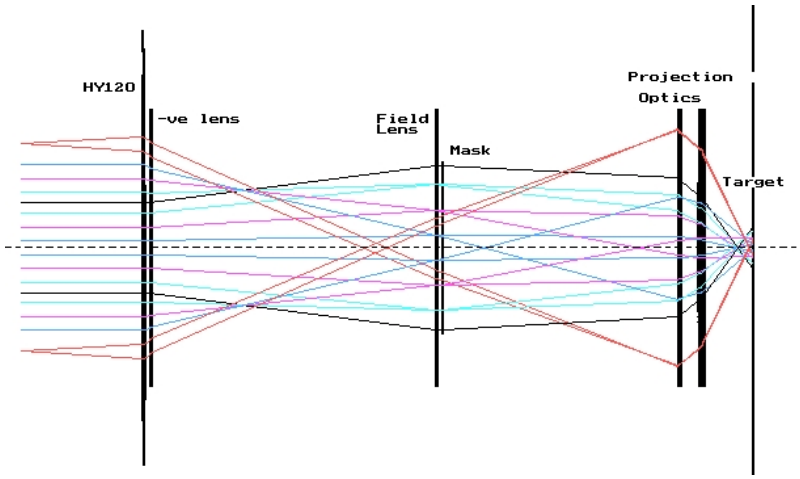
HY120 + Concentrating Lens

If HY120 is used with a lens of focal length f in close proximity, both working distance and the size of the final beam spot are reduced by the factor f/(f+w.d.)

It is NOT possible to use a lens to focus the beam to a fine spot, and expect the top-hat profile to be maintained. This is fundamental, the spatial profile in a focussed spot is essentially a map of the angular distribution of the beam, NOT of the spatial profile before the focussing lens.



HY120 with a Field Lens



In this example, taken from an industrial machine practical case study, a –ve lens is first used to enlarge the top-hat beam spot (w.d. also increases), whilst a +ve field lens is used just before the mask to ensure that ALL rays enter the projection lens aperture. Marginal rays are also represented.

HY120 used with simple lenses makes a powerful and highly efficient illumination system.