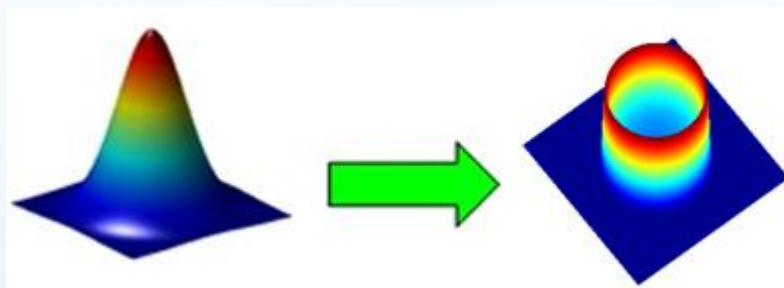


## M-Shaper for Scanning Applications



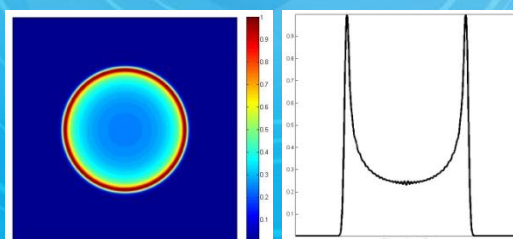
Holo/Or's M-Shaper, is a diffractive optical elements (DOE) used to transform a Gaussian laser beam (or other) into a unique 2D M-shaped intensity profile, with sharp edges in a specific work plane.

Features:	Applications:
<ul style="list-style-type: none"> <li>• Round M-Shape output profile (before integration)</li> <li>• Uniform output intensity profile when integrated over a scanned line</li> <li>• Sharp beam edge</li> <li>• High efficiency</li> <li>• High power threshold</li> <li>• Wavelengths from UV to IR</li> <li>• Optional AR/AR coating</li> </ul>	<ul style="list-style-type: none"> <li>• Laser materials processing:                             <ul style="list-style-type: none"> <li>○ welding</li> <li>○ cutting</li> <li>○ scribing</li> </ul> </li> <li>• Strong weld seams (also in Plastics)</li> </ul>

The M-Shaper optical function is not possible by conventional reflective or refractive optical elements. It provides higher quality of the process & enables more flexibility in the system configuration. For example, it allows optimization of the intensity profile, and image size, without changing the laser, fiber cable and/or optic head.

In general, the intensity profile influences the heat distribution during laser material processing. The benefits of our optimized M-shaped intensity profile, in scanning applications (i.e., for the welding process) include:

- Uniform exposure over the scanned line.
- Ensures a defined edge.
- Enables very strong weld seams.

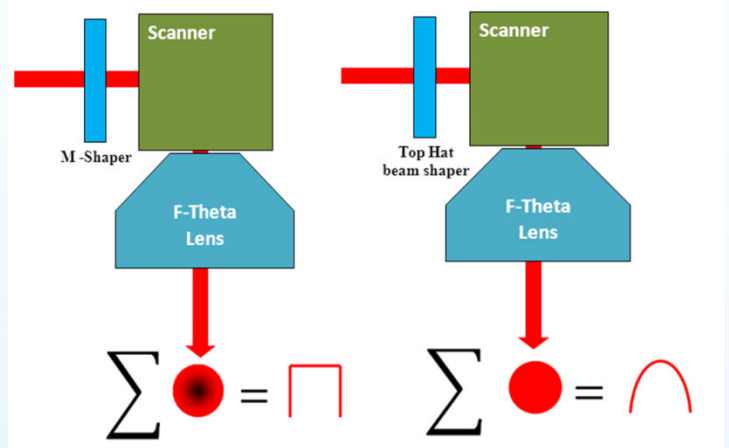


**Figure 1** – Simulated intensity profiles of diffractive M-Shaper laser spots (Without integration). Left: upper view; Right: side view.

### Design Considerations

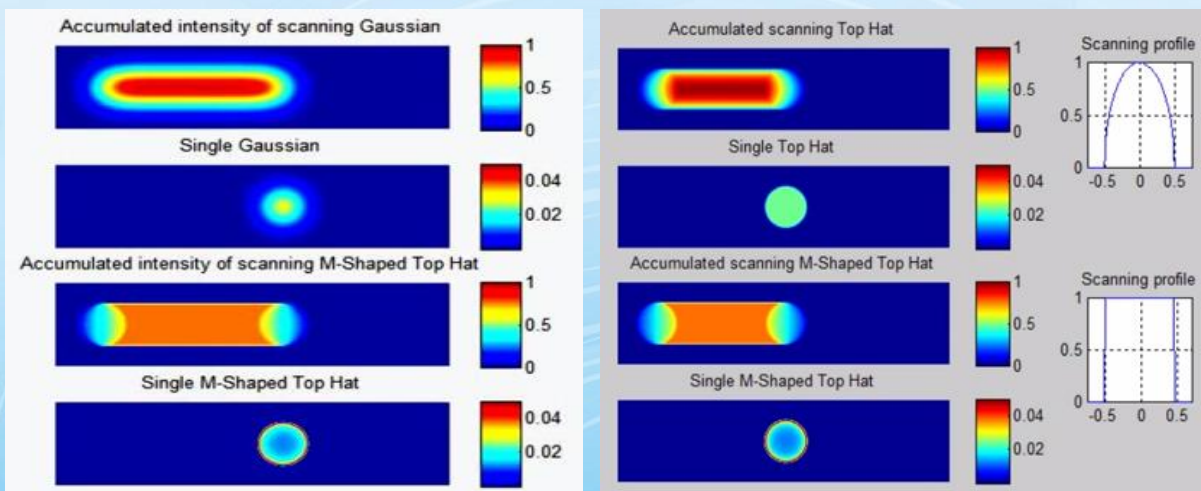
1. In principal, to get a flat-top scanning profile (as shown in Fig.3), optical designer needs to notice the following points:

- a. Use a collimated laser beam with DOE.
- b. Place the DOE before the scanning head
- c. Use a scanner lens (i.e. F-Theta lens) in order to achieve a well-focused spot at a certain distance, for all scanning angles, as shown in Fig.2.
- d. Scan in straight lines.



**Figure 2** – Schematic set-up and integrated ( $\Sigma$ ) intensity profile across scan direction. Left: with M-Shaper, Right: with flat-top beam shaper.

2. Energy distribution can be designed for any non-uniform distribution meeting.
3. The application's requirements.



**Figure 3** – Left: Gaussian intensity profile vs. M-Shaped profile, in scanning mode. Right: Top-Hat intensity profiles vs. M-Shaped profile.

### Specifications:

<b>Materials:</b>	Fused Silica, ZnSe
<b>Wavelength range:</b>	193nm to 10.6um
<b>Full angle:</b>	Large range of full angles
<b>DOE design:</b>	2-level (binary) to 16-level
<b>Diffraction efficiency:</b>	86% - 96%
<b>Element size:</b>	Few mm to 100mm
<b>Coating (optional):</b>	AR/AR Coating
<b>Custom Design:</b>	Almost any size and intensity profile

