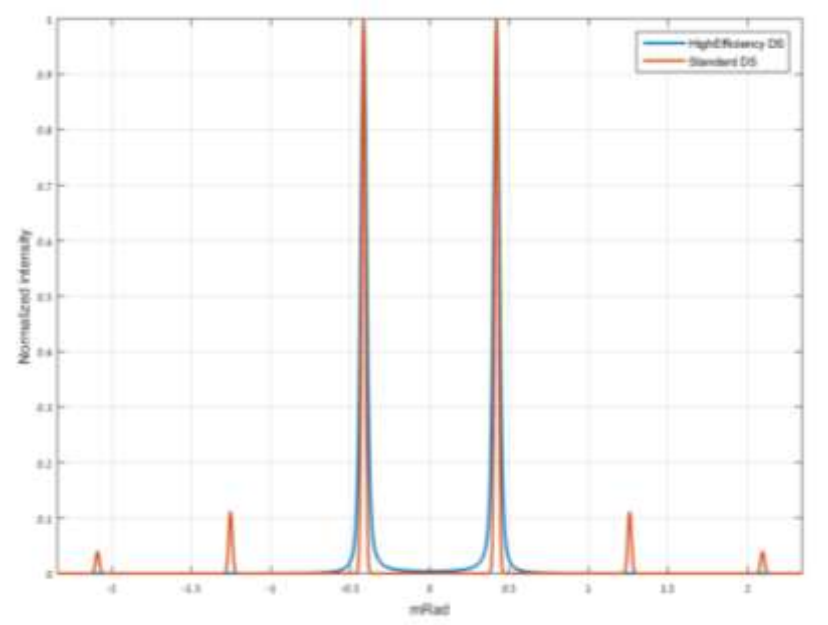
High Efficiency double spot

Holo/Or's High Efficiency Double Spot beam splitter is a special sub-aperture based diffractive optical element (DOE) capable of splitting a beam into two spots with 97% efficiency (~48% input in each beam) and almost no power in undesired orders.

Features:	Applications:
• High efficiency (~97%) • Low undesired orders (<0.2% input for highest undesired) • Tunable splitting ratio • High Laser Damage Threshold • Available in wavelength from 193nm-10600nm	• Lithography/ Thin film • Flat Panel structuring • Fine Cutting / Marking • Perforation

1x2 beam splitting is a highly useful practice in many applications, including lithography, perforation, cutting and other material processing applications. Although our standard Double Spot beam splitter DOEs are highly robust and offer up to 81% efficiency, but for demanding application the existence of even 1% input power in undesired higher orders beyond the 2 main beams is not tolerable.

For these sensitive applications, and for costumers interested in high efficiency, Holo/Or has developed a novel diffractive High Efficiency Double Spot (HEDS).



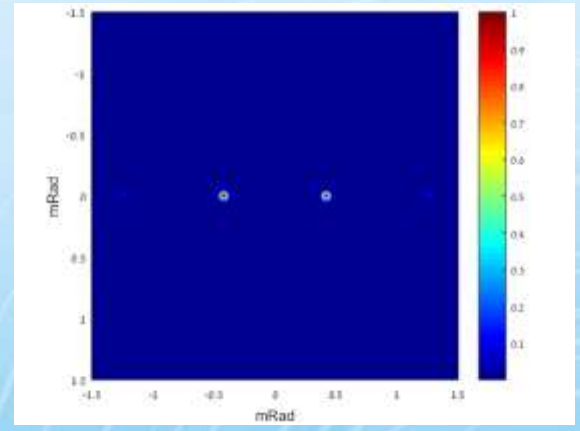
HEDs operate by a sub-aperture approach, and are therefore sensitive to centering and have an effect on the spot shape. The spot size in the splitting axis is increased (spot becomes slightly elliptical), and is only for single-mode lasers (low M^2).
Spot size is defined by the formula:

$$\text{Spot size in focal plane} = \sim DL_{SM} \cdot (M^2 + 0.75) = \sim \frac{4\lambda \cdot EFL}{\pi D} \cdot (M^2 + 0.75)$$

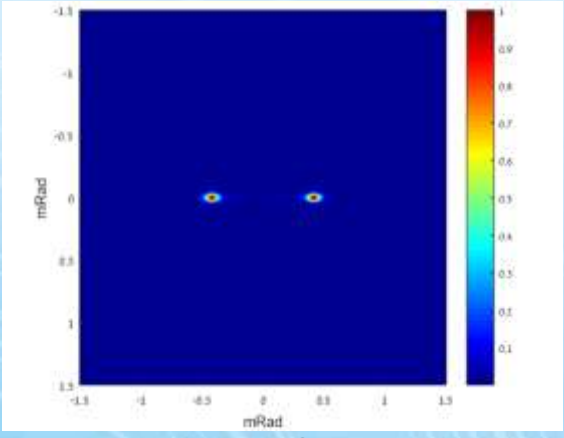
Where:

DL_{SM}– beam size for M^2=1
EFL – Effective focal length
λ – Wavelength
D – Input Beam Size
M^2 – M^2 value of input laser beam (beam quality)

For low M^2 (< ~4) the beam in focus will have some ellipticity because of added 0.75.
For higher M^2 values the spots will become symmetrical.



Standard DS



HEDS

Comparison between standard and DS and High Efficiency DS:

	Standard (DS)	High Efficiency (HEDS)
Efficiency [%]	81	~97
Sensitivity to alignment	No	Yes
Angle precision	Perfect	Perfect
Uniformity	Perfect	Alignment dependent*
Presence of undesired orders	Yes	Very low
Beam size sensitivity	No	No

* depends on input beam; for single mode input, centering accuracy of ±0.5% diameter gives 2% deviation between orders.