

DOE Expander

HOLO/OR introduces a new module for modifying certain output parameters of a Diffractive Optical Element (DOE).

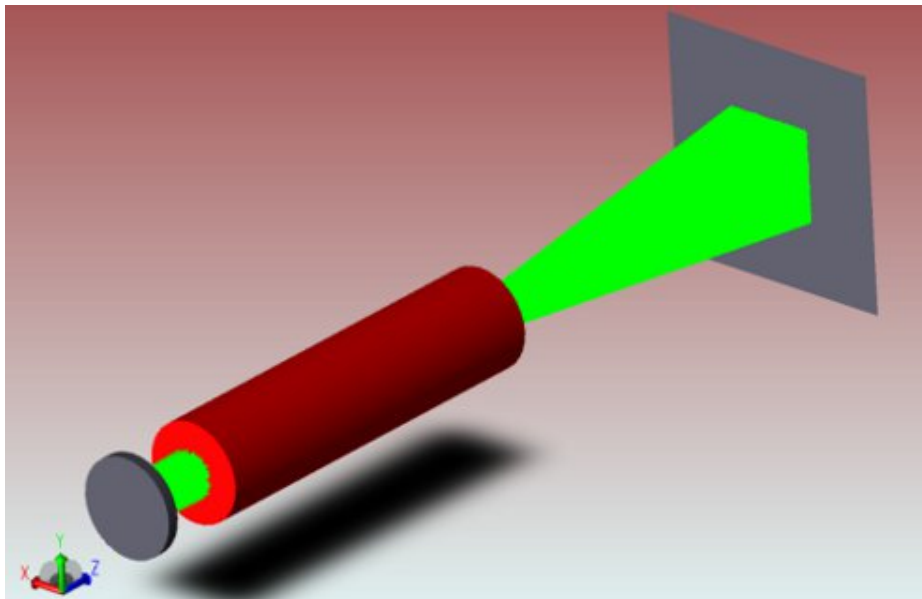
The module reduces or expands the full angle of a DOE output by a magnification factor.

Unlike standard beam expander, our module takes into considerations the characteristics of our beam shaping, beam splitting and beam foci elements, thus achieving superb results with minimal aberrations.

The module can be beneficial/suitable in the following cases:

- Using the module together with a DOE, to create an overall function that would be hard to manufacture by a single element
- Adding HOLO/OR's module to a standard, semi-standard or in-stock DOE with specific full angle to change the full angle of the DOE thus avoiding any NRE payment, and shortening delivery time

HOLO/OR is also able to customize the module according to the customer's system and request.



Specifications:

Material:	BK7 or Fused Silica
Transmission:	≥ 96%
Fixed Expansion factor:	x2.5, x4, x5, x7 and x9.7
Product categories to be used with the DOE expander:	Beam Splitter, Homogenizer / Diffuser, Top-Hat Beam Shaper, Vortex Spiral Phase Plate, Diffractive Axicon, Multi-Circles
Suitable for:	266nm to 1550nm (exists in BK7 and also in FS)

Typical set-up:

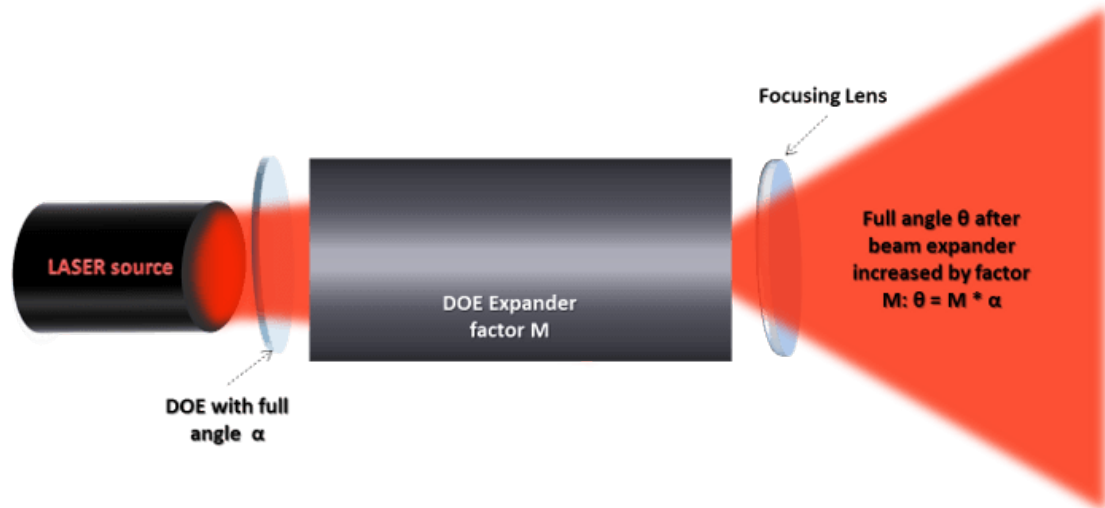


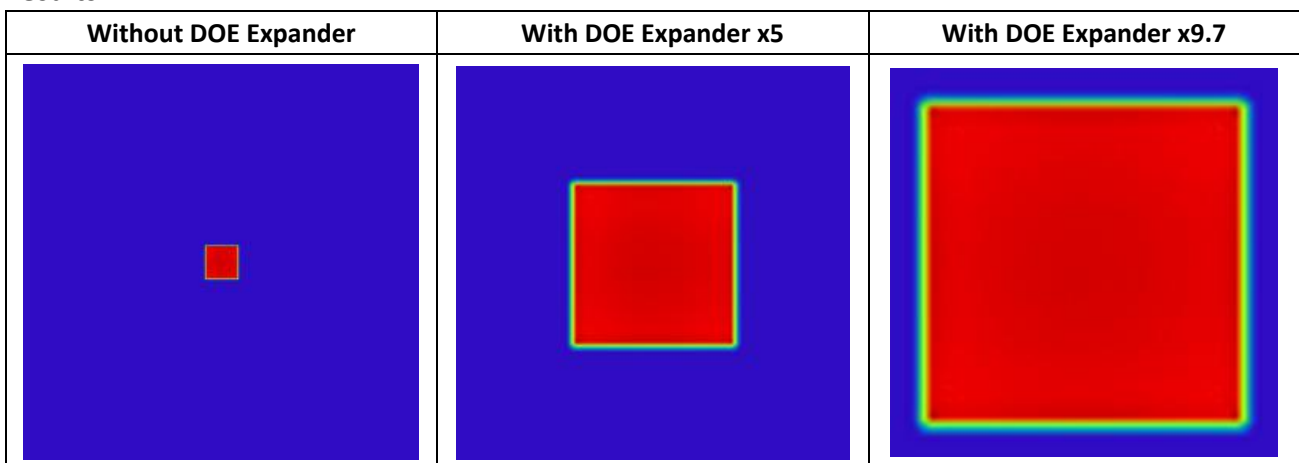
Table parameters of DOE expanders:

Part Number	Magnification	Max Entrance Aperture (mm)	Max DOE angle with aperture 15mm (deg)	Max DOE angle with aperture 22.9mm (deg)	module length*
DOE_Expander_x2,5	x2.5	22.9	4**	3**	118.9
DOE_Expander_x4	x4	22.9	3**	2**	105.4
DOE_Expander_x5	x5	22.9	3**	1.6**	118.9
DOE_Expander_x7	x7	22.9	3.2**	2.2**	172.7
DOE_Expander_x10	x9.7	22.9	3.2**	2.5**	183.2

*: not including the DOE and optional focusing lens

** : This maximal angle corresponds to maximal full angle of the DOE for square output shape. For round output shape, the maximal angle is x1.4 times larger.

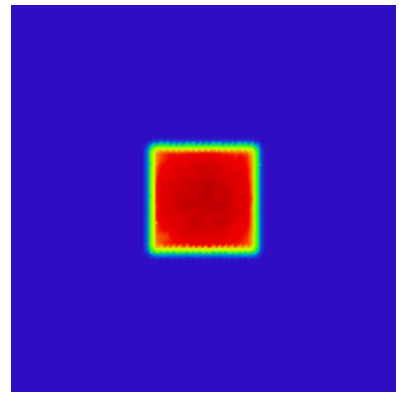
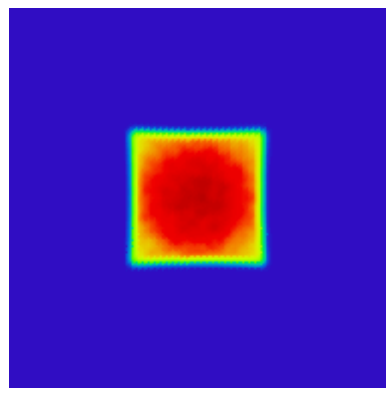
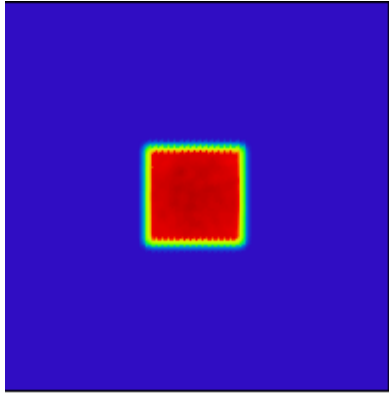
Results:



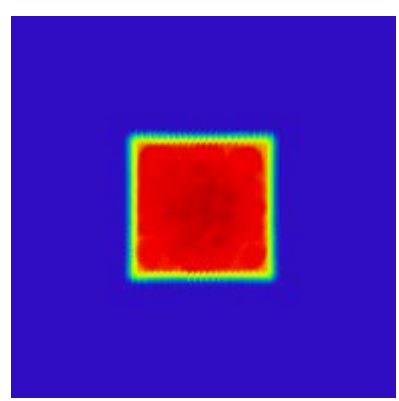
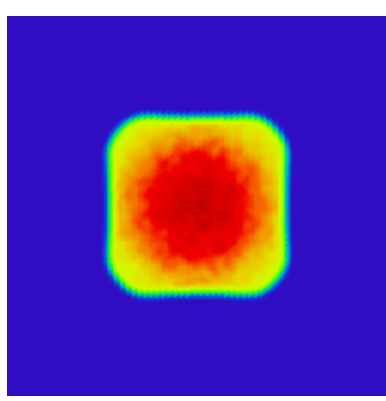
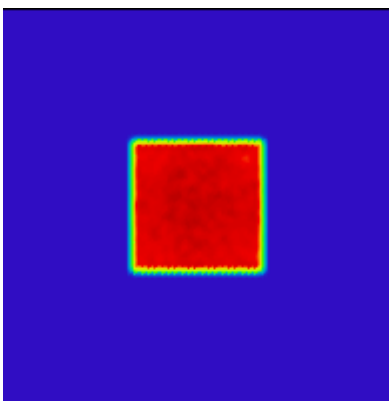
Far-field simulation results for a Square Top-Hat, from left to right, without DOE expander 1.5x1.5[deg], with DOE expander x5 7.5x7.5[deg] and with DOE expander x9.7 ~14x14[deg].

Comparison between Square Top-Hats result at image plane obtained by different expander module elements:

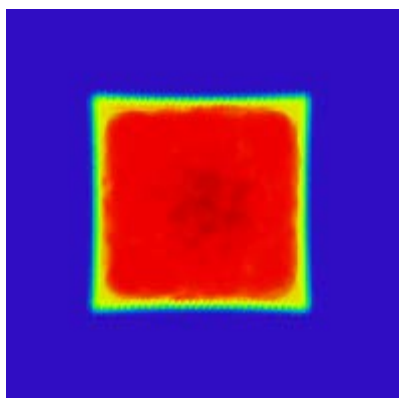
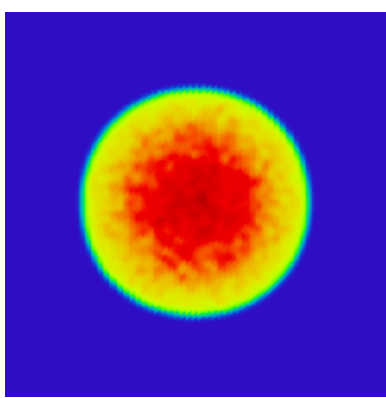
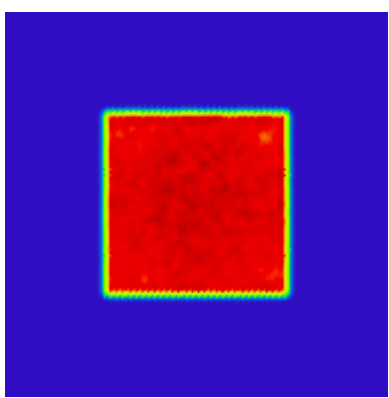
Ideal Lens (Theoretical only)	Standard Beam Expander	HOLO/OR's DOE Expander
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Simulation results for a Square Top-Hat 1.6deg in size, with (from left to right): perfect beam expander (not real lens) for ideal output spot, standard beam expander not optimized for use with a DOE and Holo/Or's DOE Expander optimized for use with a DOE and additional focusing lens after the module.
Simulation input parameters: Wavelength 532nm and input beam diameter 8mm.



Simulation results for a Square Top-Hat 2.0deg in size, with (from left to right): perfect beam expander (not real lens) for ideal output spot, standard beam expander not optimized for use with a DOE and Holo/Or's DOE Expander optimized for use with a DOE and additional focusing lens after the module.
Simulation input parameters: Wavelength 532nm and input beam diameter 6mm.



Simulation results for a Square Top-Hat 2.86deg in size, with (from left to right): perfect beam expander (not real lens) for ideal output spot, standard beam expander not optimized for use with a DOE and Holo/Or's DOE Expander optimized for use with a DOE and additional focusing lens after the module.
Simulation input parameters: Wavelength 532nm and input beam diameter 6mm.