



UDOB

Undesired Diffractive Order Blocker

USER MANUAL

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1. Safety & Handling

General recommendations for working with a laser:

<http://web.princeton.edu/sites/ehs/laserguide/appendixB.htm>






- Don't place beam at eye level.
- When leaning over a table, beware of beam directed upwards.
- Don't direct beam toward doors or windows.
- Locate controls so that the operator is not exposed to beam hazards.
- If you can see the beam through your laser eyewear, you are not fully protected.
- Don't wear watches or reflective jewelry around Class 3B or 4 lasers.
- Don't wear neckties around Class 4 open beam lasers.

Alignment

- Isolate process.
- Use lowest practical power.
- Use IR/UV viewing cards/eyewear.

Handling:

| Use gloves | Mechanical damage | Chemical | Dust |
|---|---|--|------|
|  |  |  | |

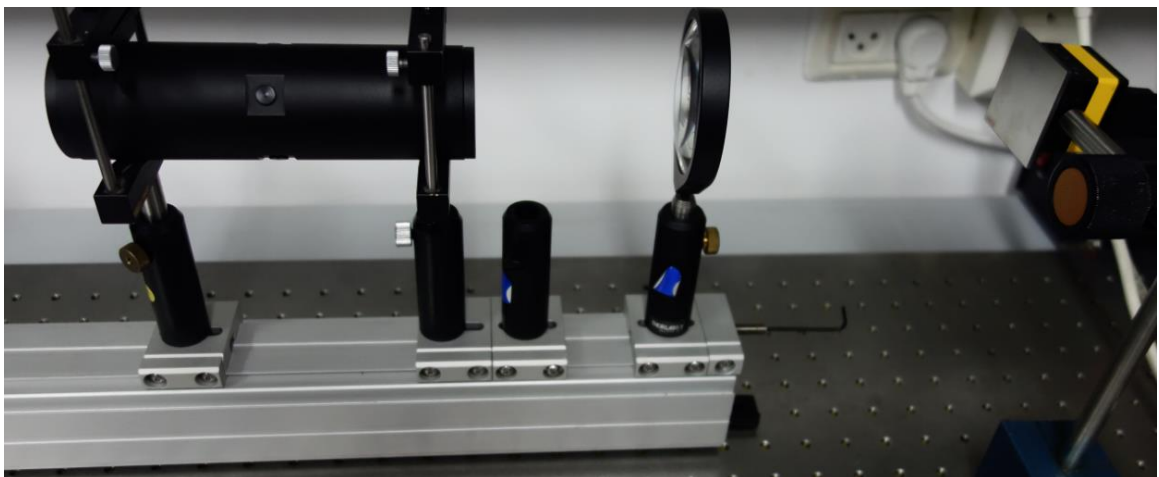
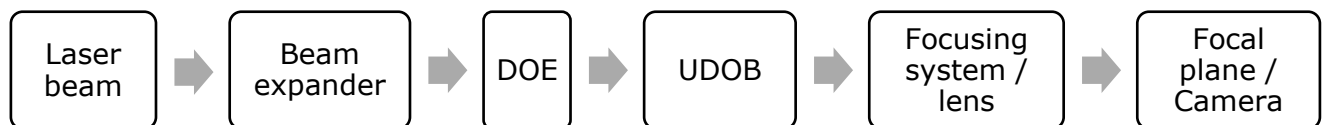
2. Introduction

HOLO/OR has designed a compact universal module for blocking undesired spots of Multi-Spots or the "halo" effect of Homogenizers, providing a precise shape and energy distribution at the focal plane.

The Undesired Diffractive Order Blocker (UDOB) can also be used to increase the edge sharpness of diffusers/homogenizers.

A typical setup for a UDOB application is shown with the following sub-modules:

- a) Laser source
- b) Optional Beam Expander
- c) Diffractive Optical Element (DOE)
- d) UDOB
- e) Focusing system / lens
- f) Working plane / Camera



3. Applications

- Medical
- Metrology
- Laser material processing

4. Technical information

Features:

- Aberration-free module
- High precision aperture
- High power aperture
- Large clear aperture
- Compact
- SM1 threads at entrance & exit of the UDOB

Physical parameters:

| Part Number | Length [mm] | Diameter [mm] | Clear Aperture [mm] | Lenses Material |
|-------------|-------------|---------------|---------------------|-----------------|
| UDOB-002 | 179 | 52 | 22.9 | Fused Silica |

Other parameters:

Anti-reflective coating: Coated

Wavelength [nm]: 355-1550nm

Recommended maximal input beam diameter [mm]: 12

Maximal angle of DOE which can be used with the UDOB [degrees]: 0.0895

Aperture shape: Round

Notes: After the maximal angle, the UDOB blocks the energy.

Tolerance on maximal angle: +/- 0.0045 [degrees]

Drawing:



Internal SM1 threads on both sides of the module

5. Installing the UDOB

The UDOB includes 2 internal SM1 threads at the entrance and exit of the module.

The DOE used with the UDOB can be inserted in one of the sides. If a focusing lens is needed, it can be inserted in the second side.

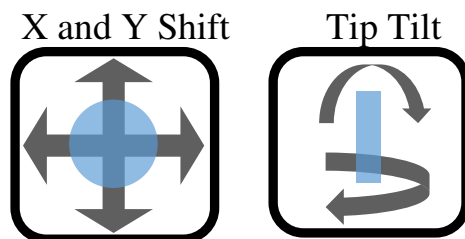
Installation instructions:

1. Align the laser output beam and the optional beam expander to the optical axis
2. Place the DOE between the laser (or the optional beam expander) and UDOB. The DOE can also be screwed into the UDOB using the internal threads SM1.
In this case, it must be inserted in the side where the HOLO/OR logo and UDOB serial number are printed.
3. **Position the UDOB on the optical axis. The side of the module where the HOLO/OR logo and UDOB serial number are printed must be facing the laser.**

First alignment of the UDOB:

The adjustment of the UDOB must be realized by placing a white paper or UV/IR card after the UDOB (before installing the focusing lens) and observing the beam of the laser on white paper.

Alignment methods:



The alignment of the UDOB can be done by placing the UDOB on a four axis stage or by adjusting the laser beam in relation to the UDOB axis.

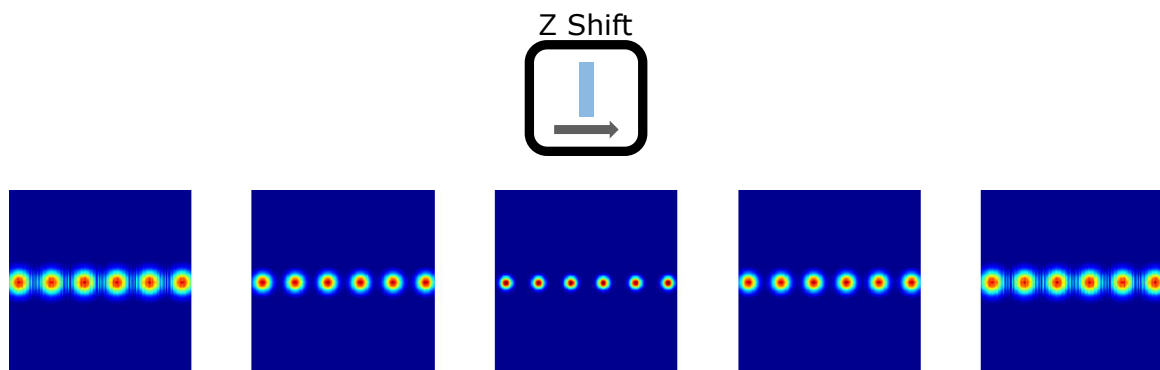


4. Remove the white paper or UV/IR card and position the focusing lens on the optical axis. The focusing lens can also be inserted into the UDOB by screwing it with adaptor into the internal SM1 threads at the exit of the UDOB.
5. Place camera/sensor at the focal plane of the focusing lens.

Note: In case of small separation angle between spots for MultiSpot products and in order to avoid overlapping of the spots, the camera/sensor must be placed at the focal plane of the focusing lens or very close to it.

After placing the camera/sensor near the focal plane, we should see some orders of the multisport on the screen or a part of the diffused shape in case of Homogenizer product. A fine-tuning of the camera position (or lens position) can be done at this stage.

Representation of fine-tuning of the focusing lens position or camera/sensor position in case of MultiSpot DOE:

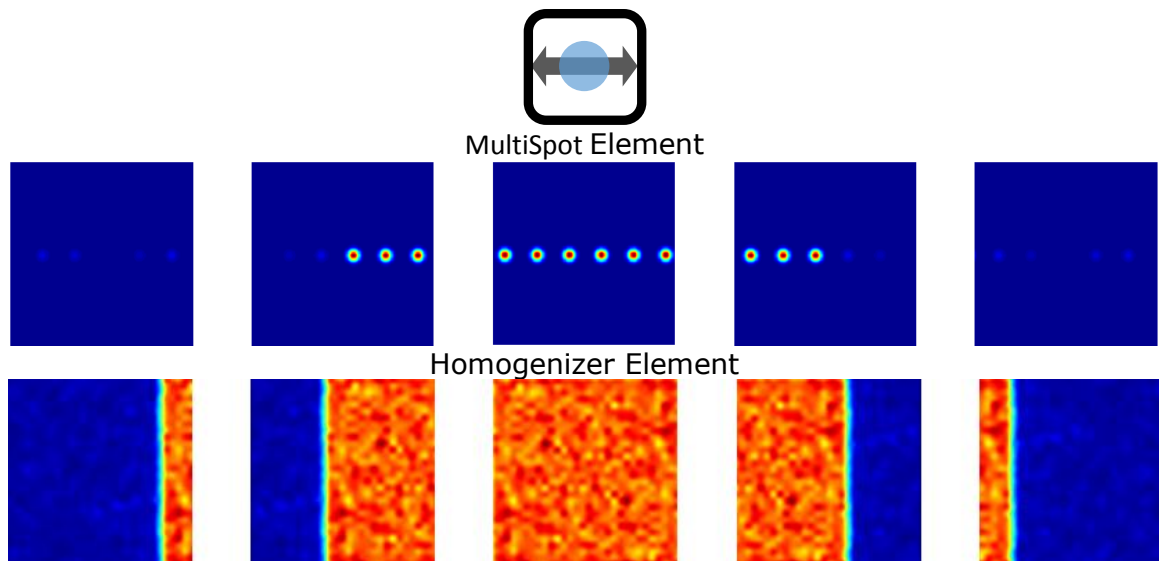


6. Fine-tuning of the UDOB

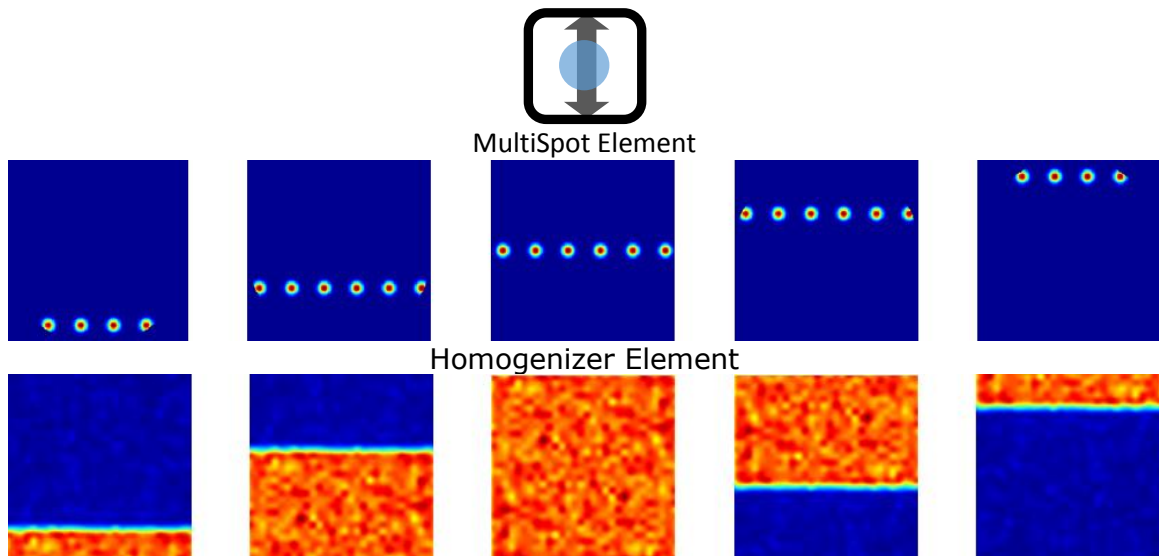
After these preparation steps a detailed fine-tuning procedure can be conducted to further optimize the UDOB adjustment.

Depending on the result on screen, fine-tuning with X, Y shift and tilt of the UDOB (or the laser beam if the adjustment is done by the laser beam) can be performed.

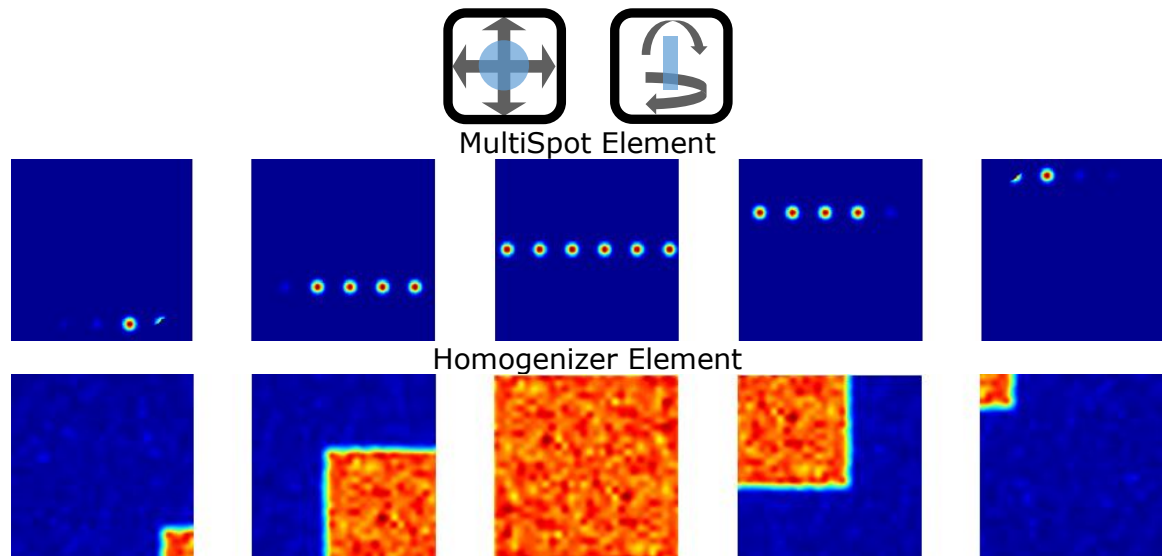
Fine-tuning in X-axis: The insertion of all desired spots in the aperture can be done by X-axis shift:



Fine-tuning in Y-axis: The insertion of all spots in the aperture can be done by Y-axis shift:



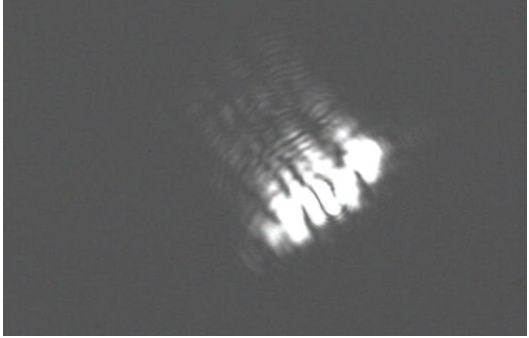



Fine-tuning in X and Y-axis or Tilt: The insertion of all spots in the aperture can be done by X and Y-axis shift or by tilt:



7. Experimental results

The UDOP has been tested with a one dimensional 1x6 beam splitter.

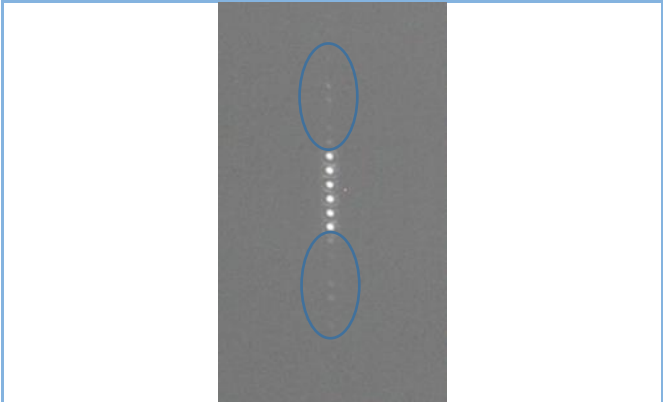
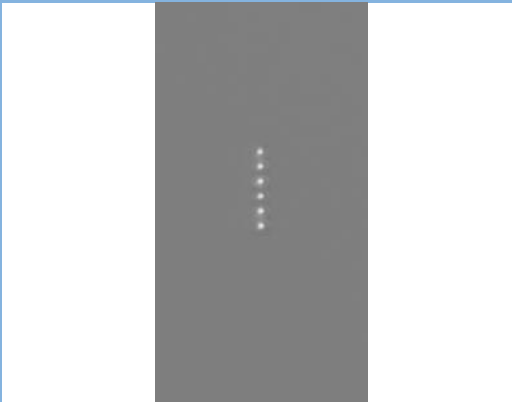
Results:

| | |
|---|--|
| (1) Camera view before fine-tuning of the lens position | (2) Camera view after fine-tuning of the lens position |
|  |  |
| (3) Camera view after some adjustment steps of the UDOP in X, Y axes and tilt | (4) Camera view after full fine-tuning of the UDOP in X, Y axes and tilt |
|  |  |

Notes: A filter has been added to avoid saturation of the sensor. The DOE was also rotated.


The UDOB has blocked all undesired orders of the MS.

Comparison between using DOE without UDOB and with UDOB:

| Camera view of the MultiSpot without using the UDOB (undesired orders into blue circle) | Camera view after fine-tuning of the lens position |
|---|--|
|  |  |



8. Problems & Solutions

8.1 I have obtained one of the situations below. What can I do?

| Situation | Action |
|--|--|
|  | Adjust the UDOB with X and Y shift. Sometimes, a tilt of the UDOB can solve the problem. |

8.2 What should I observe on the white paper after the first adjustment?

You must observe on the white paper the same spot with approximately same size as at entrance into UDOB but with additional effects of diffraction.

| Before UDOB | After UDOB |
|---|--|
|  |  |