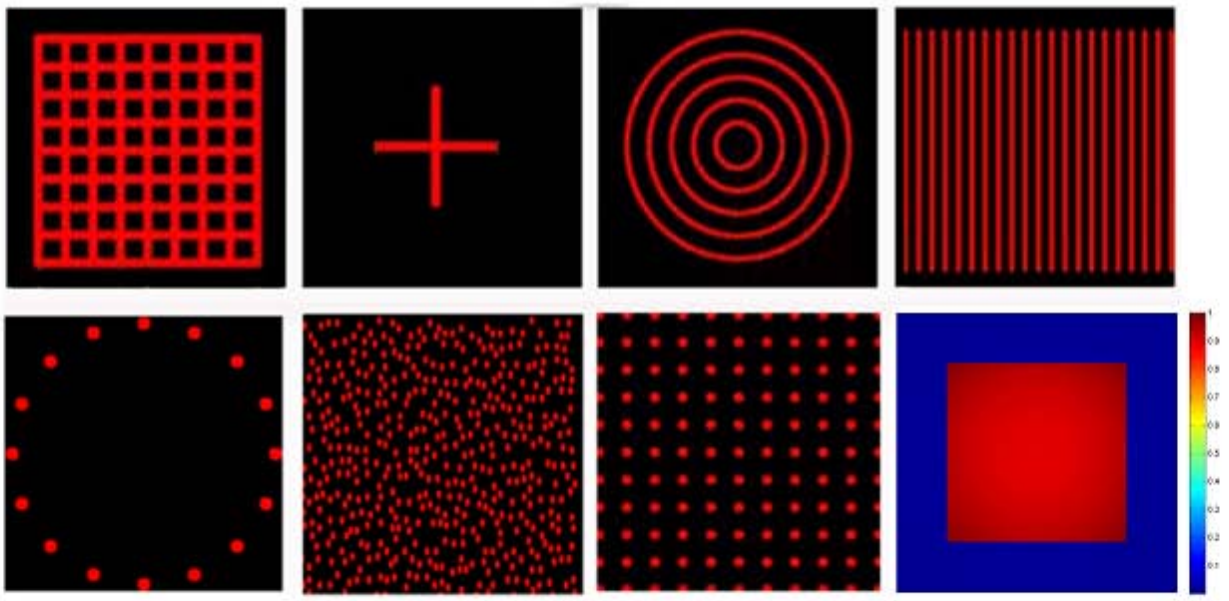
Micro- & Nano-
Refractive & Diffractive Optics



无锡奥普顿光电子有限公司

Wuxi OptonTech Ltd

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Wuxi OptonTech Ltd. specializes in diffractive optical elements (DOEs) and computer generated holograms (CGHs)for beam shaping, beam splitting and beam homogenizing (diffusing). We design and provide standard and custom DOEs and CGHs for high-performance laser and LED applications at competitive prices. We address the market needs high precision (virtually zero reconstruction error within the signal window) and high efficiency.

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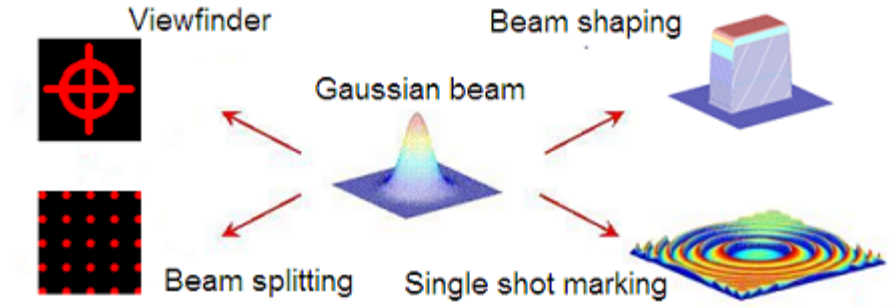


DOEs can convert a Gaussian beam to a beam with almost any intensity distribution

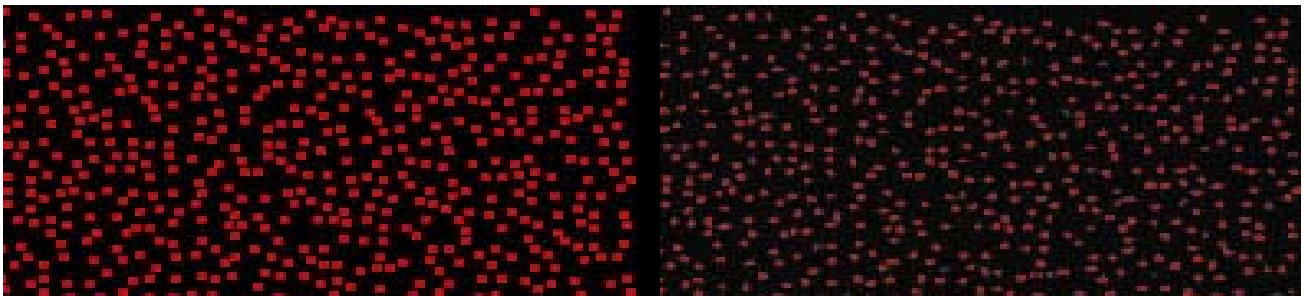
Structured light DOEs without requiring collimation: For surface-emitting lasers (e.g. VCSELs)

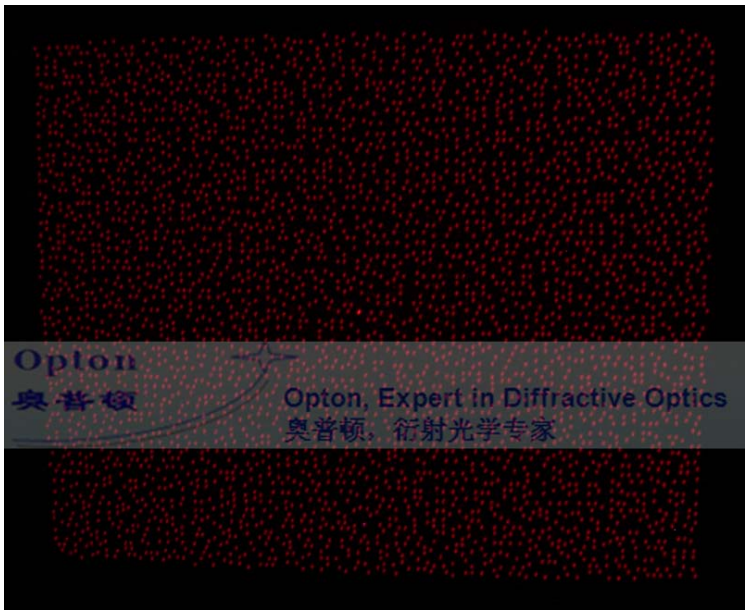
DOEs without requiring collimation can be utilized directly for the laser beams emitted by surface-emitting lasers, eliminating collimation lenses in the optical path. Consequently the size and the cost of laser modules can be significantly reduced. It is very suitable for the applications where smallness is important such as mobile phones.

VCSEL light area (μm)	FOV (deg)	Number of repeats
280 x 260	70 x 77	11 x 13
320 x 270	60 x 60	11 x 13
360 x 280	70 x 64	11 x 13
400 x 290	60 x 51	11 x 13
440 x 300	70 x 57	11 x 13
480 x 310	60 x 46	11 x 13
700 x 500	To be determined	
865 x 530	To be determined	

Standard structured light laser module for 3D sensing

For Infrared laser based human body motion sensing and gesture recognition systems, DOEs are without doubt an ideal solution. This is because DOEs can convert a laser beam to virtually arbitrary intensity distribution that matches the requirements of customers very well.

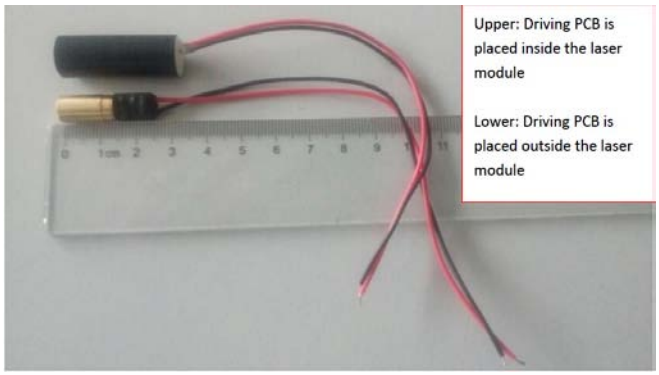


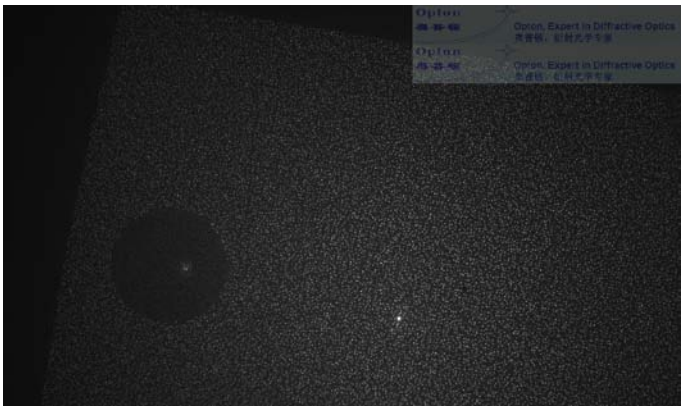


The upper left picture shows a customer's desired pattern, and the upper right is an actual pattern generated by our designed and fabricated DOE. It can be seen that the two patterns are in excellent agreement with each other.

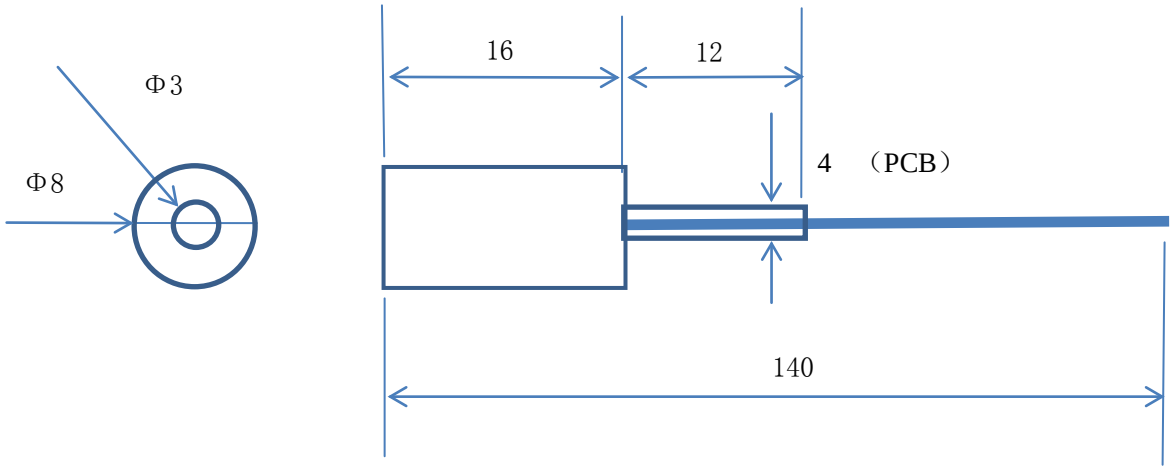
Left: Highly compatible, high-performance structured light by a DOE designed and fabricated by Wuxi OptonTech Ltd

Lower: 830 nm structured light generated by OP-SL1. The angle along the diagonal direction is 68 degrees. The dark round object on the left is a ceiling lamp.





Driving PCB board placed outside the laser module



parameters	Typical values
Central wavelength	830 nm (520 nm, 532 nm, 785 nm, 808 nm, 850 nm optional)
Laser mode	Single mode （808 nm multi-mode）
Working voltage	3 V
Working current	< 180 mA
Output laser power	150 mW (10mW/30 mW for 520 nm)
Optimal working distance	209 mm, 5000 mm (optional）
Laser module material	Cu，Al（Optional）

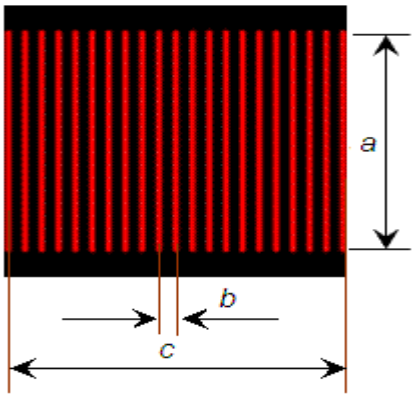
DOEs:

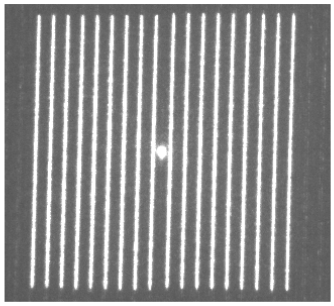
	One-piece /Cascaded	Spots number	Angle along horizontal and vertical directions	Angle along diagonal direction
OP-SL1	One-piece	34650	45 x 56 deg	68 deg
C P-SL2	Cascaded	34650	91 x 105 deg	118 deg
OP-SL3	One-piece	100,440	67 x 80 deg	94 deg
OP-SL4	One-piece	100,440	76 x 90 deg	104 deg
C P-SL4	Cascaded	100,440	76 x 90 deg	104 deg

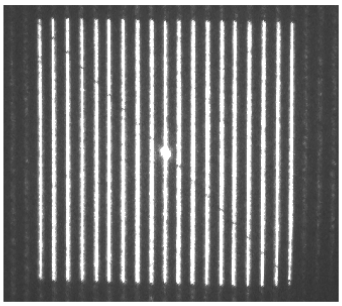
Structured light DOEs without requiring collimation: For single-point source laser light

DOEs without requiring collimation can be utilized directly for spherical wave emitted by laser diodes, eliminating collimation lenses in the optical path. Consequently the size and the cost of laser modules can be significantly reduced. It is very suitable for the applications where smallness is important such as mobile phones.

Structured light: Multi-line/stripe







Multi-line images generated by our DOEs. Taken with a point--and shoot camera

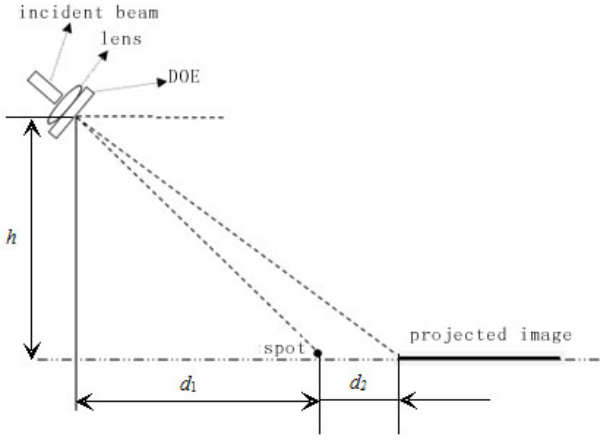
Item No	Light receiving area	Separation angle at 650nm corresponding to a, b and c	Imagesizeat650 nm and working distance of 1000 mm	Remarks
L1	6.5x 6.5 mm	*a* = 4.91° *b* = 0.27° *c* = 4.62°	*a* = 86 mm *c* = 4.7 mm *c* = 81 mm	18 lines
L2	6.5 x 6.5 mm	*a* = 4.5° *b* = 0.24° *c* = 4.34°	*a* = 78 mm *b* = 4 mm *c* = 76 mm	19 lines

Laser virtual holographic keyboard

On July 31, 2012, Wuxi OptonTech Ltd fabricated the first DOE can be used for virtual holographic keyboard.

In a laser virtual holographic keyboard, it usually uses a red laser as the light source, and generates a virtual keyboard image on a plane by the DOE. It uses an infrared laser beam and CMOS sensors to detect the users' finger position.

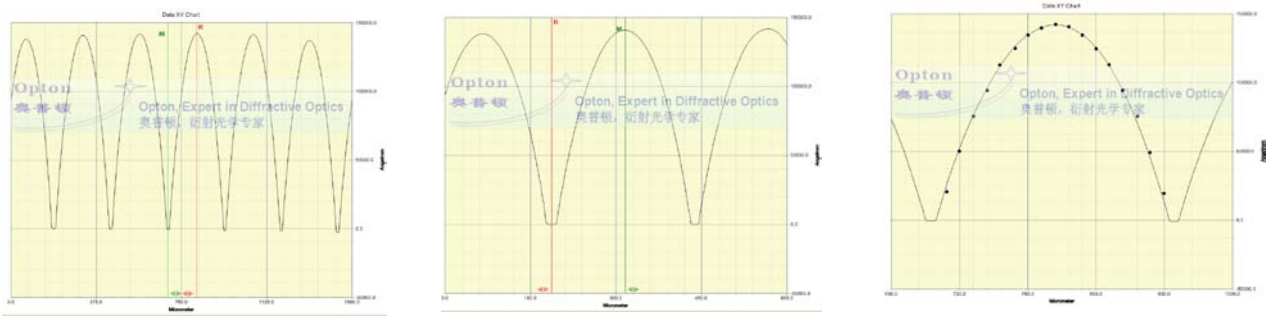
To design a virtual holographic keyboard, we need you to provide the keyboard image and its dimensions. We also need to know the vertical distance h between the DOE and the projection plane, the horizontal distance (d_1+d_2) between the DOE and the top of the image, where d_2 is the distance between the the zero order and the top of the image.



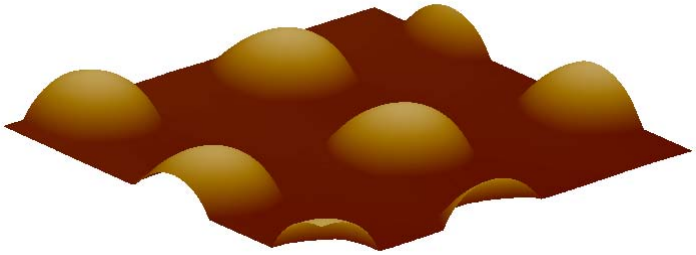
Micro refractive and diffractive lens

We provide both refractive microlens array and diffractive microlens array.

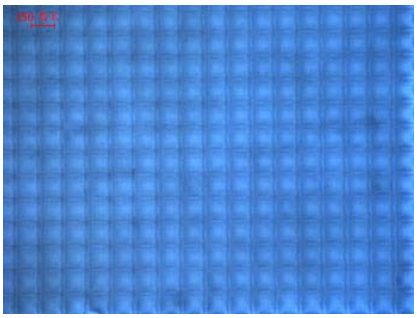
Illustration of refractive and diffractive micronlens array



Surface profile of 250 micron microlens array. The scattered spots represent a perfect spherical profile. The non-symmetry is caused by the measurement error of the profilometer, which is ideal to measure the height differences but may have error during the measurement of continuous profiles. The radius of curvature at the vertex of the profile is 547 micron. The conic constant is approximate 0.5.



AFM picture of 140 micron microlens array

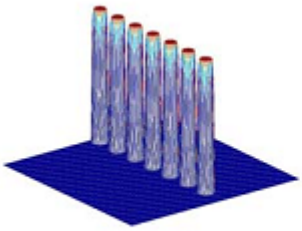


Picture of 150 micron square microlens array

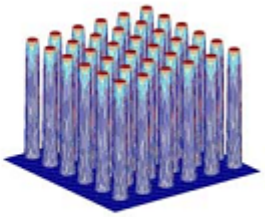
Pitch	Microlenses Number	Element size	Radius curvature (um)	Focal length (um)
7x7 um	2800x2800	20x20 mm	~3	~7
14x14 um	570x570	8x8 mm	7~15	12~36
150 x 150 um	50x50	8x8 mm	690	~1500
250 x 250 um	32x32	8x8 mm	~547	~1000

Beam splitter

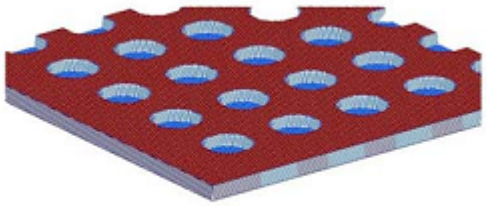
Beam splitters can be used for simultaneous laser drilling (perforating) of multi-holes, fiber coupling, etc. Specific applications of laser drilling include pre-weakening of cartons and metal-foils in packaging industry, high-speed laser texturing, cigarette filters, etc. We can split a single beam into up to a million highly uniform beams.



1-D Beam Splitting



2-D Beam Splitting



Simultaneous laser drilling of multi-holes by 2-D beam splitters

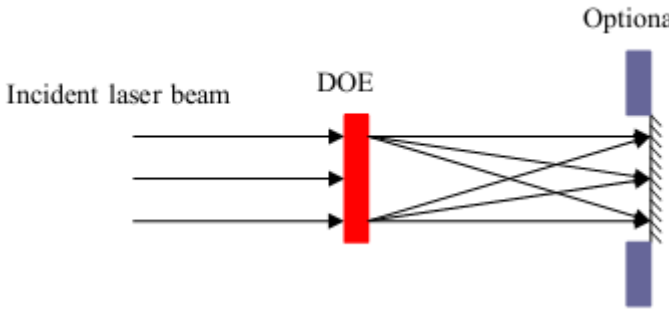
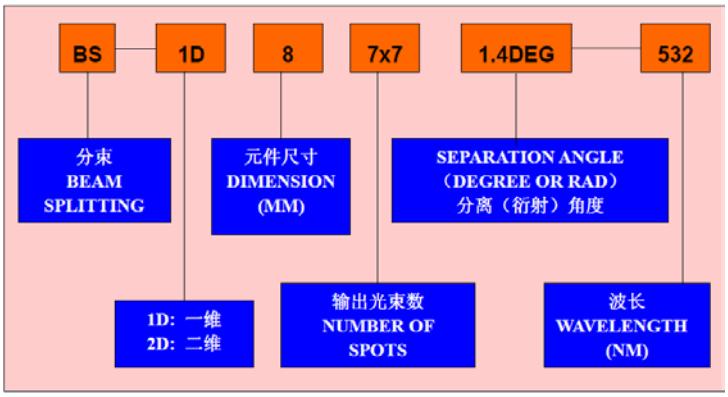
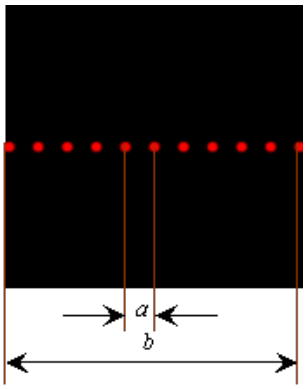
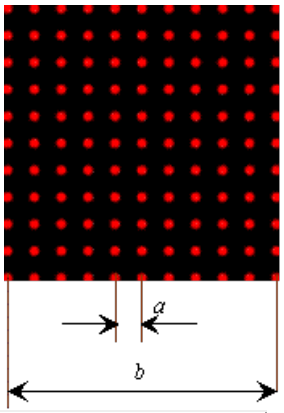


Illustration of laser processing setup with a diffractive beam splitter

Product nomination for diffractive beam splitter elements





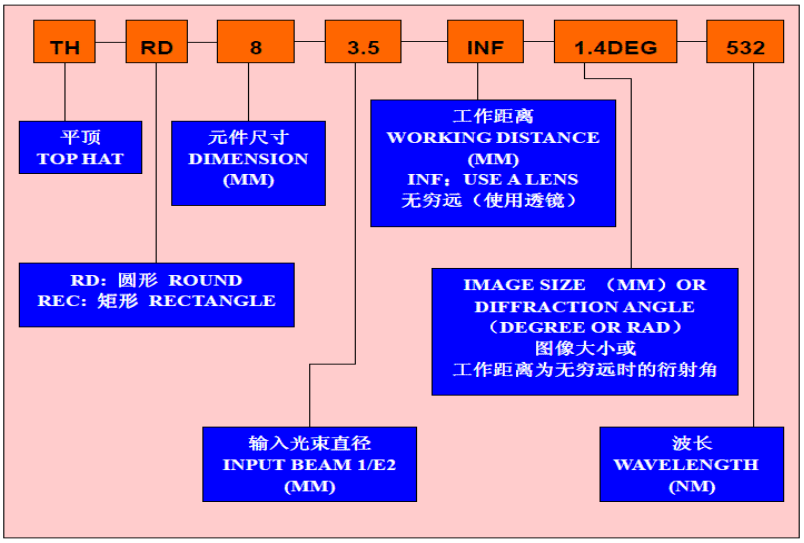


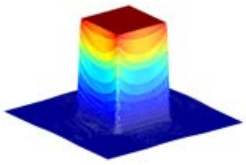
Product Item	Light Receiving area	Number of Spots	Separation angle corresponding to a and b	Wavelength
BS-1D-8-1x3-40DEG-808	8 x 8 mm	1x3	A = 40° B = 80°	808 nm（other wavelengths available）
BS-1D-8-1x24-0.17DEG-	7.5 x 7.5mm	1x24	A = 0.17° B = 4.0°	808 nm（other wavelengths available）
BS-1D-8-1x25-0.17DEG-808	7.5 x 7.5mm	1x25	A = 0.17° B = 4.2°	808 nm（other wavelengths available）
BS-2D-8-10x10-532	8 x 8 mm	10 x10	A = 0.38°	532 nm

Top Hat Beam shaper

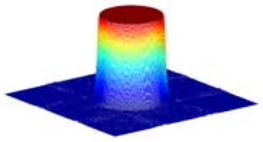
Diffractive beam shapers convert a laser beam with Gaussian intensity distribution into a beam with an accurate and almost arbitrary intensity distribution. Specific applications include precise control of treatment depth in laser heat treatment, laser hardening, cladding; turning a laser beam into a square or hexagon to increase the fill-factor in laser direct writing; and laser tweezers, etc.

Product nomination for diffractive top-hat beam-shaping elements





Guassian to rectangular top-hat

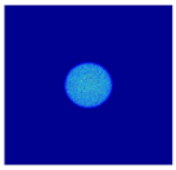
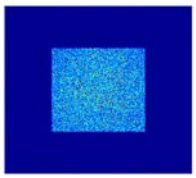
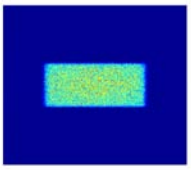


Guassian to circular top-hat

Product Item	DOE size	Image size	wavelength	Working distance
TH-RD-8-3-300-0.5-2080	8mm	0.5mm	2080nm	300mm
TH-RD-8-3-300-1-2080	8mm	1mm	2080nm	300mm
TH-RD-8-3-300-2-2080	8mm	2mm	2080nm	300mm
TH-RD-8-3-300-3-2080	8mm	3mm	2080nm	300mm
TH-REC-8-2-INF-20mrad-1064	8 mm	20 mrad	1064 nm	Infinate
TH-REC-8-2-200-4x4-1064	8 mm	4x4 mm	1064 nm	200 mm
TH-REC-8-2.5-INF-20mrad-1064	8 mm	20 mrad	1064 nm	Infinate
TH-REC-8-2.5-200-4x4-1064	8 mm	4x4 mm	1064 nm	200 mm
TH-REC-8-3-INF-20mrad-1064	8 mm	20 mrad	1064 nm	Infinate
TH-REC-8-3-200-4x4-1064	8 mm	4x4 mm	1064 nm	200 mm
TH-REC-8-3.5-INF-20mrad-1064	8 mm	20 mrad	1064 nm	Infinate
TH-REC-8-3.5-200-4x4-1064	8 mm	4x4 mm	1064 nm	200 mm
TH-REC-8-4-INF-20mrad-1064	8 mm	20 mrad	1064 nm	Infinate
TH-REC-8-4-200-4x4-1064	8 mm	4x4 mm	1064 nm	200 mm
TH-REC-20-8-1700-5x5-1064	20 mm	5x5 mm	1064 nm	1700 mm
TH-REC--8-3-200-4x4-532	8 mm	4x4 mm	532 nm	200 mm
TH-RD-8-3.5-200-0.5-532	8 mm	0.5mm	532 nm	200 mm
TH-REC-8-3.5-200-1x1-532	8 mm	1x1 mm	532 nm	200 mm
TH-REC-8-3.5-200-4x4-532	8 mm	4x4 mm	532 nm	200 mm

Diffuser tolerant to incident beam size and beam quality

One main advantage of a beam diffuser is its insensitivity to the incident beam quality and the change of intensity.

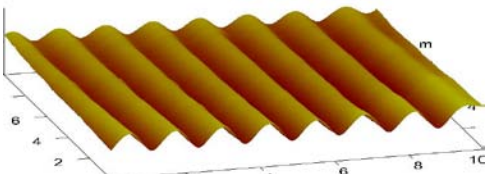




Item No	DOE size	wavelength	Diffraction angle
DF-RD-6-2-473	6 x 6 mm	473 nm	2°
DF-RD-6-3-589	6 x 6 mm	589 nm	3°
DF-RD-6-4-785	6 x 6 mm	785 nm	4°
DF-RD-6-4-808	6 x 6 mm	808 nm	4°

Beam homogenizer tolerant to incident beam size and beam quality

Item No	DOE size	wavelength	Diffraction angle
SFH-REC-1p09mrad-940	18 mm	940 nm	1.09 mrad
SFH-RD-12p5-25DEG-785	12.5x12.5	785 nm	25 degree
SFH-RD-12p5-25DEG-785-S (using a spherical wave)	12.5 x 12.5	785 nm	25 degree
REC-10-83p25x83p25mrad-532	10x10	532 nm	83.25x83.25mrad
SFH-REC-50-4p3x11mrad-1064	Φ50	1064 nm	4.3x11 mrad
SFH-REC-50-2x5p3mrad-1064	Φ50	1064 nm	2x5.3mrad
SFH-REC-50-20x20mrad-1064	Φ50	1064 nm	20x20 mrad
SFH-REC-25-10x10mrad-1064	Φ25	1064 nm	10x10 mrad
SFH-RD-50-20mrad-1064	Φ50	1064 nm	20 mrad
SFH-REC-30-p5xp5mrad-1064	30 x 30	1064 nm	0.5x0.5 mrad
SFH-REC-12-p15xp45mrad-355	12x12 mm	355 nm	0.15x0.45 mrad
SFH-REC-25-p15xp45mrad-355	25x25 mm	355 nm	0.15x0.45 mrad
SFH-REC-18-4mrad-355	18x18 mm	355 nm	4 mrad
SFH-REC-18-5p2mrad-355	18x18 mm	355 nm	5.2 mrad

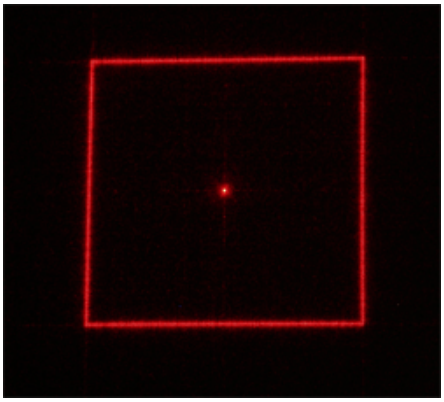
Phase gratings for optical linear encoder



AFM image of our fabricated DOE.
Size:10x10micron.

Grating rulers use infrared LED, visible light LED, and small light bulbs or semiconductor laser as light source, using moore provisions, diffraction or holographic principle to high precision position measurement, mainly used in modern machine tools, machining centers and various measuring instruments. Grating ruler can be used for linear displacement or angular displacement measurement, the accuracy is commonly from hundreds of microns to submicron, through interpolation, the resolution can reach one nanometer.

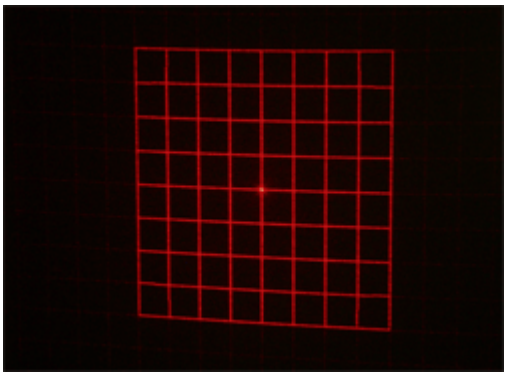
Square pattern



Zero order: ~3% of incident laser power (can be eliminated)
Intensity of ghost image: ~5% of the signal intensity

The left picture shows the image of the actual square pattern produced by our designed and fabricated DOE. The image was taken with a point-and shoot camera.

Grids

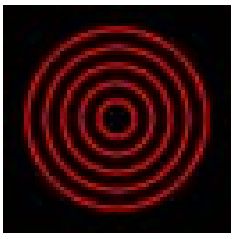


Full angle: 5.8 degrees at 650 nm
Zero order: ~2% of incident laser power
Intensity of ghost image: ~5% of the signal intensity

The left picture shows the image of the actual square pattern produced by our designed and fabricated DOE. The image was taken with a point-and shoot camera.

Item No	DOE size	Full angle at 650 nm	Description
G8-8	6x6 mm	8 deg	8x8 grids
G9-8	6x6 mm	8 deg	9x9 grids

Rings



Item No	DOE size	Image size at 650 nm & 1000 mm distance	Description
R9-1	8x8 mm	r_1=9.7 mm ..... r_9=87.5 mm	9 evenly-spaced rings
R5-1	6x6 mm	$r1$=11.90 mm r_2=23.80 mm r_3=35.71 mm r_4=47.61 mm r_5=59.51 mm	5 evenly-spaced rings

Crosshair

Item No	DOE size	Diffraction angle at 532 nm
CH-2014-2-24-1	5 x 5 mm	20 deg
CH-2014-2-24-2	5 x 5 mm	60 deg

Taken with a point-and shoot camera

Long/short focal depth DOE

DOEs with long or short depth of focus can be achieved without changing the incident beam size or the working distance (focal length) as well as the focal spot size.

Beam sampler

Without affecting the main laser beam, a diffractive beam sampler produces two laser beams which are exactly the same as the main beam except for having lower power. These two low-power laser beam can be used for monitoring the intensity distribution of the main beam. We offer both reflective and transmissive beam samplers.

Intra-Cavity beam shaper

Traditional laser resonators generate laser beams with a Gaussian distribution. By using an intra-cavity DOE, the resonator can extract more energy an d generate a more uniform super-Gaussian beam, thus greatly improve the electrical-optical conversion efficiency.

We need the following parameters to provide you custom DOEs

DOEs you would like to order:

☐ Beam splitter; ☐ Top-hat beam shaper; ☐ Other beam shaping; ☐ microlens array;

☐ inclined surface beam shaping（virtual holographic keyboard）; ☐ Other applications

Required diffractive efficiency: _____

Please attach your required target image (irradiance/intensity distribution) if necessary

Wavelength: _____

Material: _____

Dimensions and shape of DOE: _____

Incident beam diameter(radius x 2): _____

The input laser power and laser type: _____

Mode（Single Mode or Multi Mode）: _____

☐（beam splitting）Separation angle of 2 adjacent output beams: _____

☐（Tot-hat）working distance: _____

Size of output beam spot or diffraction angle of output beam: _____

☐（Laser oblique projection）Output image and the size: _____

The vertical distance diffraction element to the projection plane h, Diffraction element to the image at the top of the horizontal distance (d_1+d_2),

And the projection plane of zero level to the top of the image distance d_2: _____

☐（microlens array）Pitch between microlens: _____

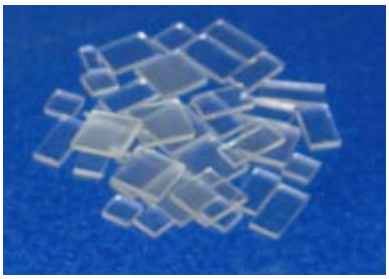
Micro lens focal length: _____

Overall size device（LWH）: _____

If plating coating: _____

Specifications

Material： Fused silica, BK7 (K9) glass, resin, PC, GaAS etc.
Wavelength: 193-10600 nm
Dimenstion,: up to Φ 150 mm
Phase levels: 16
Feature size: >300 nm



Contact us

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