



## Capabilities Brochure

**Company** – Over 20 years of experience in a young company

**People** – Experienced, Motivated, Dedicated

**Technology** – World leader in holographic, electro-optical and SolGel technologies

**Products** – Hundreds of products based on patented Light Shaping Diffuser® technology



## Our Company



Luminit, formerly the Light Shaping Diffuser Division of Physical Optics Corporation, was formed as a privately held company in 2005. All of the employees, facilities and assets of that division, including a large number of US and international patents and patents pending, were transferred to Luminit.

Light Shaping Diffusers® and LSD® are registered trademarks for our patented, holographically-recorded diffusers which are integral to virtually all of our products.

## Our People

Our employees are motivated and dedicated to producing the world's finest optical products. Over a third of Luminit's employees have advanced degrees and nearly a third of the employees have worked for over 15 years with holographically-recorded diffusers.



## Our Customers

Luminit sells through a direct sales force, in addition to domestic and international distributors, to major manufacturers, integrators and developers in the OEM optical marketplace worldwide. Luminit provides unique, customized and mass-produced solutions which are utilized in many consumer and commercial products. Our customers are typically companies who have sophisticated diffuser requirements for use in display, projection screen, architectural lighting, set/event lighting or biomedical/high technology products.

## Our Markets

In addition to the growth in traditional markets, our marketplace is rapidly changing and expanding due to the increased use of bright, energy efficient LED light sources. Because of the multiple small, very bright light sources, sophisticated diffusers are required to homogenize the light with minimal light loss. Initial uses in automobile stoplights and traffic signals required minimal diffusion, but most other uses require a homogenized, softer light. Luminit has existing products and a demonstrated capability to apply technology to solve the challenges of these changing markets.

## Our Facilities



With over 25,000 square feet, our facilities house some of the world's most advanced equipment for R&D, engineering and manufacturing of optics, holographic microstructure devices and displays including:

- Four fully equipped R&D laboratories for developing holographic components, advanced displays and optoelectronic devices.
- An optics laboratory for custom design projects and birefringence measurement.
- Class 100-5,000 clean rooms for producing holographically recorded masters.
- Custom-designed webs that can replicate roll-to-roll seamless flexible microstructure films for displays and other applications.
- Two additional proprietary webs that can produce the same microstructures on rigid or flexible surfaces up to 60 by 48 inches.
- Several hand-replication stations for rapid prototyping and manufacturing of specialty parts.
- A chemistry lab and replication workstation for SolGel (Glass-on-Glass) diffusers.
- Dedicated QA and metrology stations equipped with three radiometric goniometers for the precise determination of scattering angles.
- ISO 9001:2000 quality certification for all products manufactured in these facilities.

## Our Core Competencies

Luminit has core competencies in the development and mass production of Light Shaping Diffusers and other optical devices. These include:

- Continuous and Discrete Casting of 3-D Microstructures
- Roll-to-Roll Production Capability
- Holographic Optical Element Design and Fabrication
- Holographic Display Systems
- Seamed and Seamless Mastering
- Optical Design and Prototyping
- SolGel Technology
- Custom Ink Formulations
- High Resolution Spectrometers
- Product Commercialization
- Processing on Specialty and Customer-Supplied Materials

## Our Commitment

Luminit is committed to be the *BEST QUALITY* supplier in our industry – the *BEST QUALITY* people, the *BEST QUALITY* products, and the *BEST QUALITY* customer support. This is engrained throughout our organization. All of our people are committed to quality assurance; quality is a part of each process in our sales, engineering, manufacturing and administration departments.



# Our Technology: Light Shaping Diffusers (LSD)



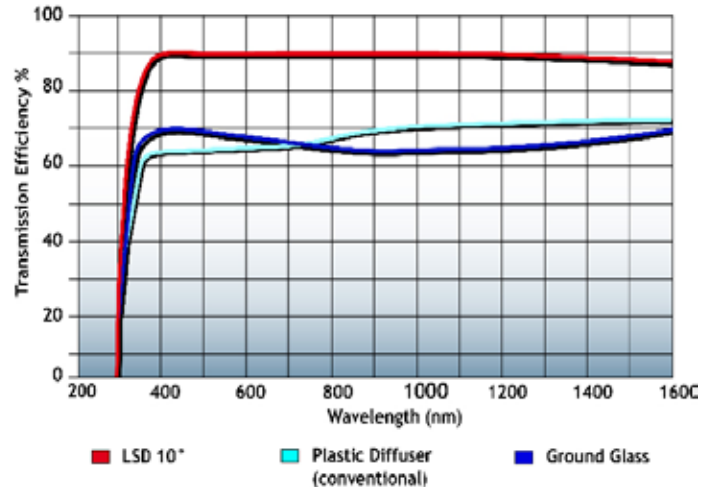
Light Shaping Diffusers are holographically-recorded randomized surface structures which enable:

- High Transmission Efficiency – up to 92%
- Beam Shaping – LSDs that precisely shape, control and distribute light
- Available Diffuser Angles: 0.2 to 95 degrees FWHM (Full Width, Half Maximum)
- Homogenized Light – LSDs greatly smooth and homogenize light sources while providing uniform light in critical applications

## High Transmission Efficiency

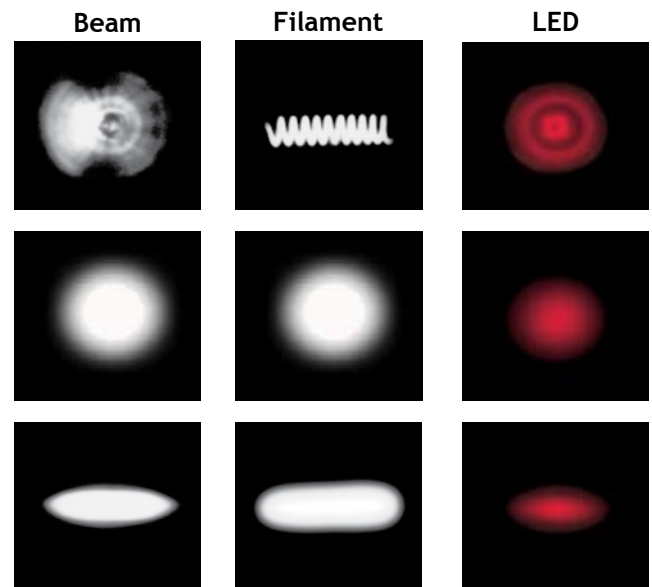
Luminit’s holographic Light Shaping Diffusers offer superior optical transmission from 200nm to 1500nm. Depending on the angle of distribution, LSDs will achieve between 85% and 92% transmission efficiency. The low back-scatter of LSD structures are anti-reflective in nature and utilize light that would otherwise be wasted due to Fresnel loss.

A clear piece of polycarbonate substrate is 89% transmissive. With LSD, transmission improves to 92%. Note that Luminit measures transmission utilizing an integrated sphere with the LSD structure incident to the light source. Following are the transmission efficiencies of a 10° LSD measured at the following wavelengths: 532nm-90%, 632nm-90%, 850nm-89%, 980nm-89%, 1064nm-89%, 1550nm-88%. (UV Transmitting Diffusers are also available.)



## Beam Shaping

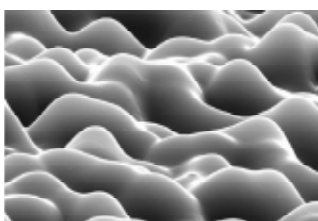
LSDs precisely shape, control and distribute light. The patented holographic master recording process allows a variety of circular or elliptical light patterns. Standard circular angles range from 0.5° to 80° FWHM. A wide variety of standard elliptical angles are available from 0.2°x10° to 95°x35°.



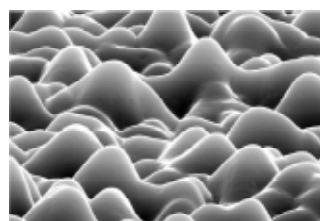
## Homogenized Light

“Hotspots” and uneven light distribution are common problems with filament, arc, LED, CCFL, fiberoptic and laser light sources. LSDs greatly smooth and homogenize the source while providing uniform light in critical applications such as LCD backlights, LED displays, machine vision, automotive lighting and viewing screens.

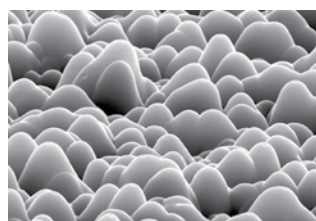
Large angle LSDs produce the greatest degree of homogenized light.



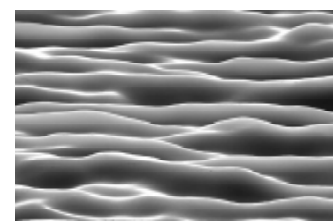
50° LSD  
SEM Structure 1500x



60° LSD  
SEM Structure 1500x



80° LSD  
SEM Structure 1500x



60° x 1° Elliptical LSD  
SEM Structure 600x

# Our Products – Applications of LSDs



## Illumination Systems

- Aircraft Inspection and Reading Lights
- Architectural Lighting
- Automotive Headlights, Taillights
- Automotive Instrument Clusters
- Dashboard Lighting
- Interior Lighting
- High Intensity Discharge Lamps
- Set/Event Lighting
- Signs & Displays



Sample Products



Concept Car Lighting



Dashboards



Washing Machine Control



Texas State Capital Lighting

## Backlight Systems

- Cell Phone & PDA Displays
- Cockpit Instrumentation Displays
- LCD Screens
- Light Box



Sample Products



Celine Dion Concert Lighting



Backlit Exit Signs

## Machine Vision

- Barcode Scanners
- Metrology Systems
- Microscope Ring Lights
- Backlight, Light Lines



LED Light-Line



Bar Code Scanner



Sample Products

## Our Products – Applications of LSDs



### Front Projection – LORS® Lights On Reflection Screens

- Brilliant high gain/high resolution screens
- Excellent viewing in high ambient light conditions
- The surface relief structures allow precise placement of photons in the desired area
- Precise dispersion angles allow maximum utilization of available light
- Portable screens – carry them with you
- Custom viewing angles are available
- Works well as a directional retro-reflector



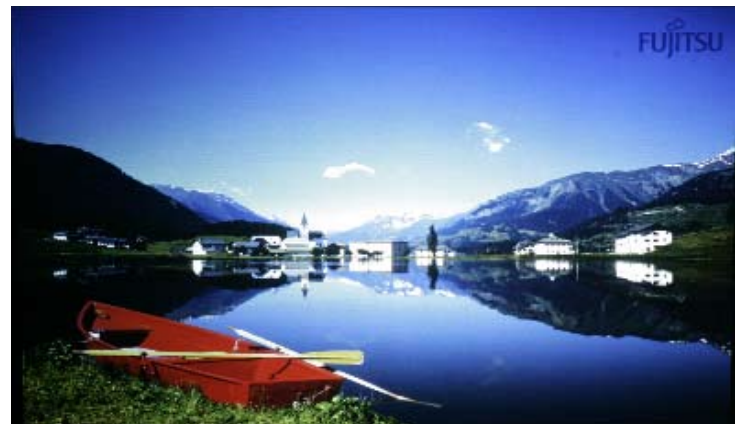
LORS® Film on the left of a conventional projection screen

### Rear Projection – DDS® Directional Display Screens

- High resolution/high gain rear projection screens
- Low back-scattering for high transmission
- Randomized (non-periodic) structures eliminate Moiré fringes and chromatic aberration
- Minimal effects of polarization. Acrylic substrate offers low birefringence
- Can be combined with polarizer, Fresnel, prismatic structures and contrast-correction material
- A second front surface diffusing angle reduces glare, scintillation and specular reflection
- Custom viewing angles are available ( $0.2^\circ$  to  $100^\circ$ )



Portable DDS® Screen



95° x 25° DDS® Rear Projection TV Screen

### Biomedical/High Technology

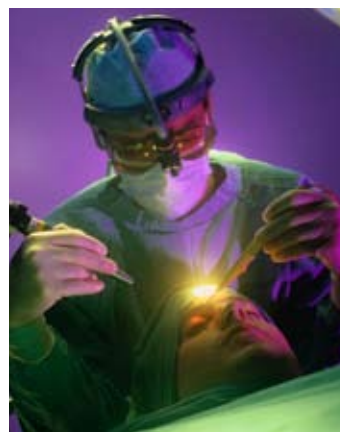
- Cosmetic Laser Systems
- Dental Laser Systems
- Diagnostic Laser Systems
- Eye Surgery Laser Systems
- Eye Screening Stations



UV Tooth Whitener



Microscopy



Cosmetic Laser System



Blood Analyzer

# Our Products – Light Shaping Diffuser Advantages



- High transmission efficiency – up to 92%
- Controlled diffusion cone angle
- Available diffuser angles: 0.2 to 95 degrees FWHM
- Homogenization of light sources
- Multiple substrate selections: PC, PET, AC, glass & others
- Works in UV, Visible and NIR spectra
- No Moiré fringes or chromatic aberration
- Can be integrated into any plano surface geometric optic

Light Shaping Diffusers come in many different sizes, from large films used in rear projection television screens to miniature glass-on-glass diffusers used in laser surgery equipment.

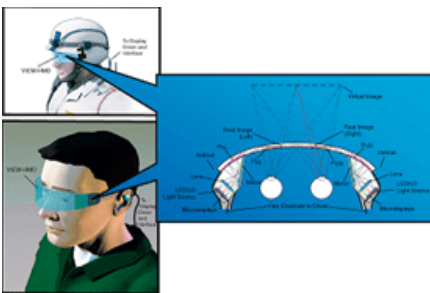
They come in many different shapes, from flat sheets to LSDs embossed or injection molded in combination with optical lenses such as Fresnels and condenser lenses.

They also come in many different diffuser angles and patterns from 0.2° to 95° in straight, circular or elliptical patterns and also on many different substrates.

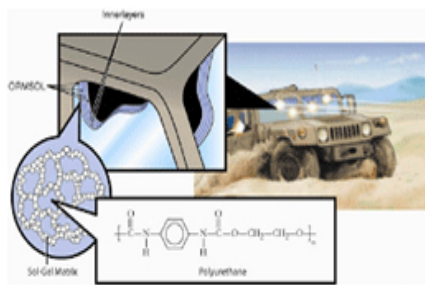
In all, there are hundreds of permutations of products in our LSD family and literally hundreds of applications.

## Our Advanced Research and Development

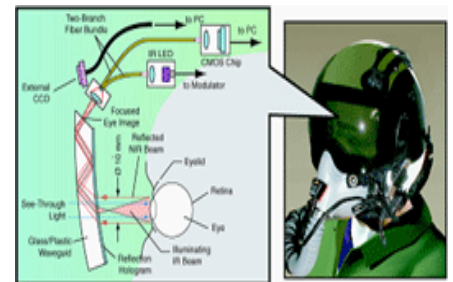
Luminit has a sizeable state-of-the-art R&D department engaging in SBIR and other advanced research projects for over 15 years. Our scientists and engineers are continually expanding the frontiers of the holographic, optical and SolGel technologies we have developed. There is a substantial carry-over of these technologies into our commercial products. Some project examples:



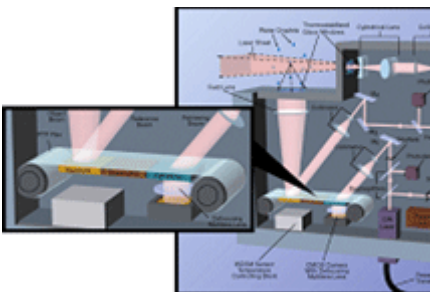
Enhanced Waveguided View



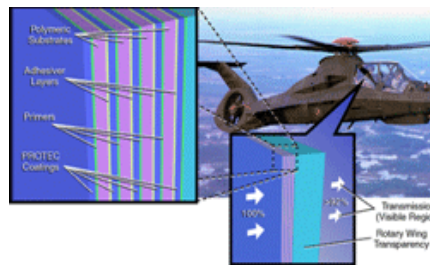
Lightweight Optically Clear  
Armor Protection



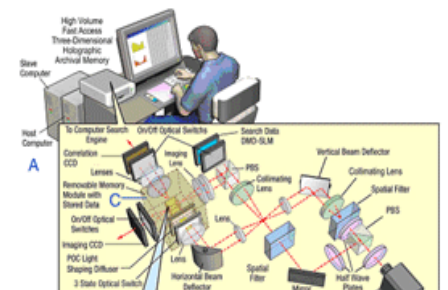
Holographic Infrared Eye Tracker



Real Time Holographic Rain  
Drop Size Measurement



Protective Film



3D Holographic Archival  
Memory

Please consult our website ([www.luminitco.com](http://www.luminitco.com)) for a description of these technologies.



### Optical Design

Luminit's Design Center pulls from a unique blend of design engineers, optical engineers, scientists and software experts to offer advanced optical designs, ray tracing and rapid prototyping. Our designs are already being used in many automotive, aerospace, display, LCD/cellphone backlight, scanner and machine vision applications.



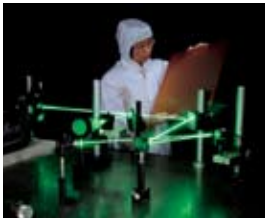
### Clean Rooms

Several classes of clean rooms are used to protect products from contamination in the mastering process through final inspection.



### Mass Production

Web replication of thin and rigid films utilizing custom designed high volume web equipment.



### Holographic Mastering

Full scale mastering and production submastering up to 72" x 72" and up to 48" wide seamless.



### Embossing

Light Shaping Diffuser structures can be embossed directly on lenses and other optics.



### Custom Replication

LSD diffusers (or periodic/non-periodic optical structures) can be directly replicated onto a variety of substrates, lenses and optical components.



### Cut to Print/Silk Screened

Light Shaping Diffusers can be custom cut and/or silkscreened to customer specifications



### Glass-on-Glass

High temperature and UV-transmissive diffusers are fabricated using SolGel glass technology.



### Surface Protection

Several types of protective films are available to protect diffuser surfaces during handling and shipping.



### Injection Molding

Light Shaping Diffuser structures can be faithfully reproduced by injection molding them into a variety of optical components, including waveguide optics.



### LSD Films and Sheets

Light Shaping Diffusers can be mass-produced in seamless rolls of up to 6,000 square feet, or in sheets of any size up to 48"x60". They are available in angles from 0.2° to 95° FWHM in straight, circular or elliptical patterns.



Tel (310) 320-1066 Fax (310) 320-8067 www.luminitco.com

