

# CAPABILITIES



## COMPANY

Over 15 Years of Experience

## PEOPLE

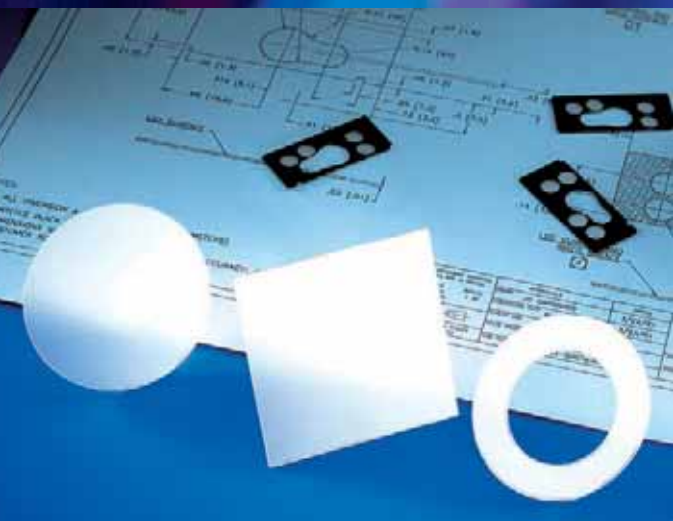
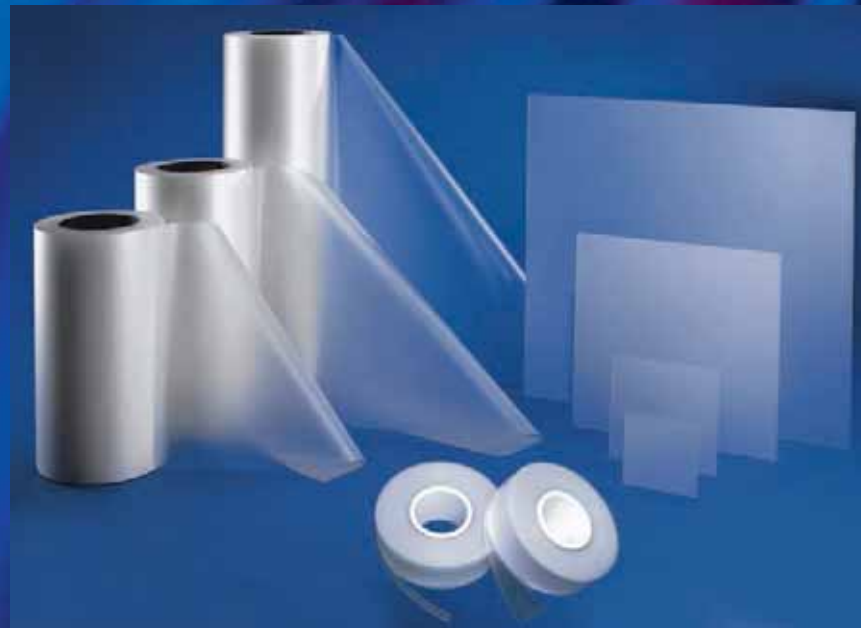
Experienced, Motivated, Dedicated

## TECHNOLOGY

World Leader in Holographic, Electro-Optical and SolGel Technologies

## PRODUCTS

Hundreds of products based on patented Light Shaping Diffuser™ Technology



**Luminit**<sup>™</sup>  
SHAPING LIGHT AS NEEDED



## OUR COMPANY

Light Shaping Diffusers were developed for NASA by Physical Optics Corporation (POC). The core group that is now Luminit was formed within POC as the Light Shaping Displays Division to commercialize Light Shaping Diffusers. This division was spun off from POC in 2005 as a separate company – Luminit. 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.

In 2008, Luminit entered into a strategic alliance agreement with Asahi Kasei Corporation to transfer patented holographically mastered light diffusion technologies. This alliance includes a technology transfer agreement and development agreements as well as a minority investment by Asahi Kasei in Luminit.

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

## OUR PEOPLE

Our employees (shown above) 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 10 years or more with holographically mastered 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 LED lighting, display, projection screen, architectural lighting, set/event lighting or biomedical/high technology products.

Luminit provides diffusers in a variety of formats and options that make it suitable for mass produced consumer and commercial products. Our customers design our high performance diffusers into their applications including LED based general lighting, front projection screens, architectural lighting, entertainment lighting, and a variety of high technology illumination systems.

## OUR MARKETS

In addition to the growth in traditional markets, our marketplace is rapidly changing and expanding with the increased adoption of high brightness LEDs (HBLEDs). Due to the nature of HBLEDs (pixilated and bright) and their costs, the use of higher transmission diffusers is required in most applications to meet certain system performance criteria. One of the first applications for our diffuser was in edge lit light guides for cell phone displays since this was the first market to adopt LEDs. Today Luminit diffusers are used in a variety of devices and fixtures including fingerprint scanners, blood analyzers, movie projectors, 3D displays, LCD displays, recessed LED lights, color changing wall washers and linear cove lights. Luminit has existing products and a demonstrated capability to apply technology to solve the challenges of these changing markets.



## OUR FACILITIES

With over 33,000 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 opto-electronic devices.
- An optics laboratory for custom design projects and birefringence measurement.
- Class 100-10,000 clean rooms for producing holographically recorded masters.
- Custom-designed webs in clean rooms 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 40 by 20 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 9001:2008 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
- Product Commercialization
- Processing on Specialty and Customer-Supplied Materials

## OUR COMMITMENT

Luminit's quality goal is to exceed customer expectations.

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, production, and administration departments.

## OUR TECHNOLOGY:

### LIGHT SHAPING DIFFUSERS (LSD)

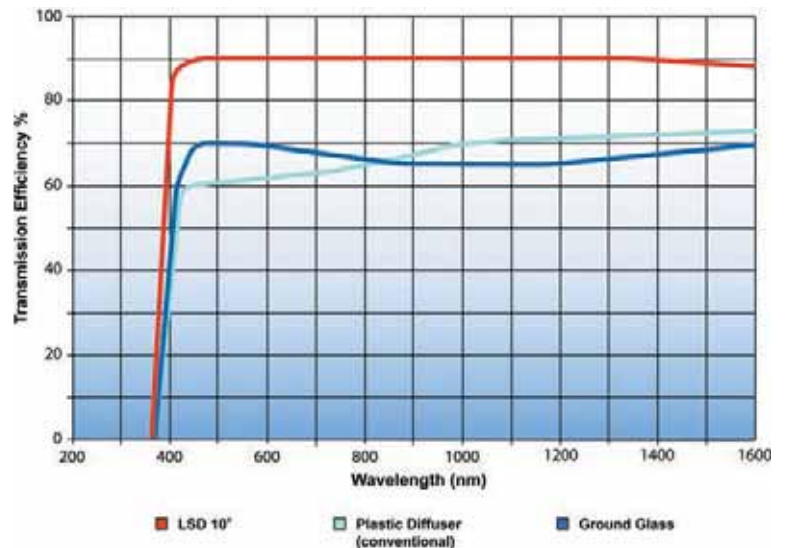
Light Shaping Diffusers are holographically recorded randomized surface structures, which enable:

- High Transmission Efficiency – up to 92%
- Beam Shaping – LSDs that precisely shape, control and distribute light
- 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 400nm to 1600nm. Depending on the angle of distribution, LSDs will achieve between 85% and 92% transmission efficiency. The low back-scatter of LSD structures is anti-reflective in nature and utilizes 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.)



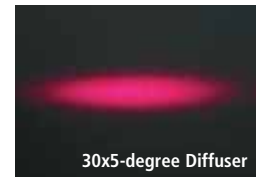
### BEAM SHAPING

LSDs precisely shape, control and distribute light. The patented holographic master recording process allows a variety of circular and elliptical light patterns. Standard circular angles range from 0.5° to 80° FWHM. A wide variety of standard elliptical angles, ranging from 10°x0.2° to 95°x35°, are available.

### HOMOGENIZED LIGHT

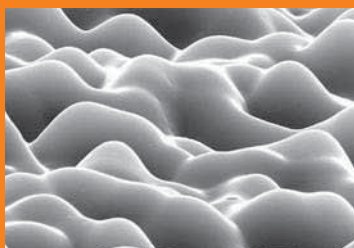
"Hotspots" and uneven light distribution are common problems with filament, arc, LED, CCFL, fiber-optic and laser light sources. LSDs greatly smooth and homogenize the source while providing uniform light in critical applications such as LCD backlights, LED displays, machine vision, automotive lighting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

Large angle LSDs produce the greatest degree of homogenized light.

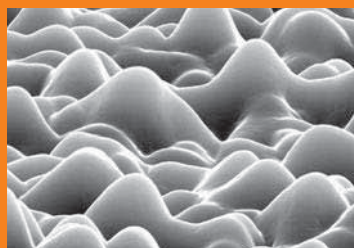


Left Column:  
No Diffuser  
5° Diffuser  
30° Diffuser

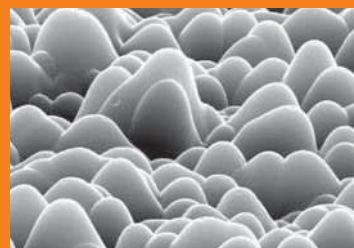
Right Column:  
30°x5° Diffuser  
60°x1° Diffuser



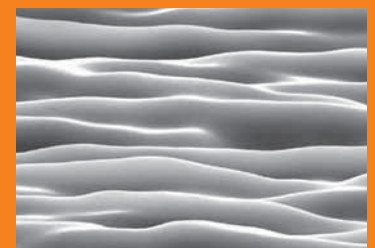
50° LSD  
SEM Structure 1500x



60° LSD  
SEM Structure 1500x



80° LSD  
SEM Structure 1500x



60° x 1° Elliptical LSD  
SEM Structure 600x



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

## OUR PRODUCTS

### APPLICATIONS OF LSDs

#### LED LIGHTING

- Architectural Lighting
- Can Lights
- Decorative Lighting
- Pool Lighting
- Set/Event Lighting
- Wall Wash



LED Array 60°x10°



Texas State Capital Lighting

#### ILLUMINATION SYSTEMS

- Aircraft Inspection Lights
- Aircraft Reading Lights
- Automotive Instrument Clusters
- High Intensity Discharge Lamps
- Signs & Displays

#### BACKLIGHT SYSTEMS

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

#### MACHINE VISION

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



Concept Car Lighting

## 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
- Works well as a directional retro-reflector



LORS® film on the left of a conventional projection screen

#### BIOMEDICAL HIGH TECHNOLOGY

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



Microscopy



UV Tooth Whitener



Cosmetic Laser System



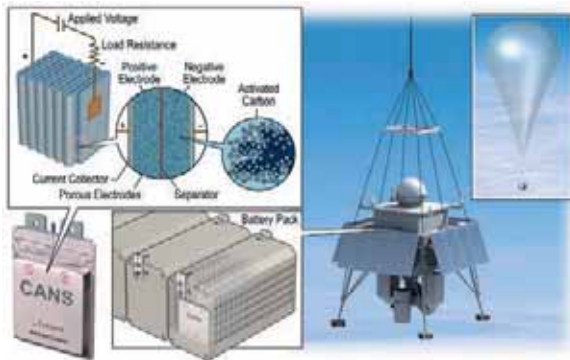
Blood Analyzer

## Light Shaping Diffuser **ADVANTAGES**

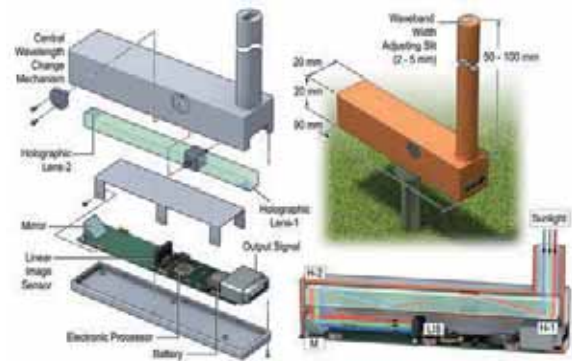
- High Transmission Efficiency – up to 92%
- Controlled Diffusion Cone Angle
- Available Diffuser Angles: 0.2° to 95° FWHM
- Circular and Elliptical Angles
- Homogenization of Light Sources
- Multiple Substrate Selections: PC, PET, AC, UL rated, UV stable, Glass & others
- Works in UV, Visible and NIR Spectrums
- No Moiré Fringes or Chromatic Aberration
- Many Sizes Available
- Can be Integrated into any Plano Surface Geometric Optic

## ADVANCED RESEARCH AND DEVELOPMENT

Luminit has a sizeable state-of-the-art R&D department which has been engaging in SBIR and other advanced research projects for over 5 years. Our scientists and engineers are continually expanding the frontiers of the holographic, optical, SolGel and material technologies we have developed. There is a substantial carry-over of these technologies into our commercial products. Some project examples follow:



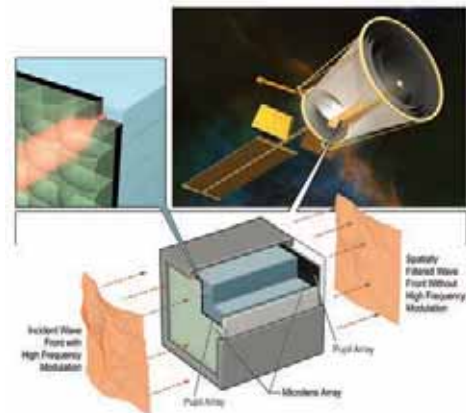
▲ Carbon Nanotube-based Supercapacitor (CANS)



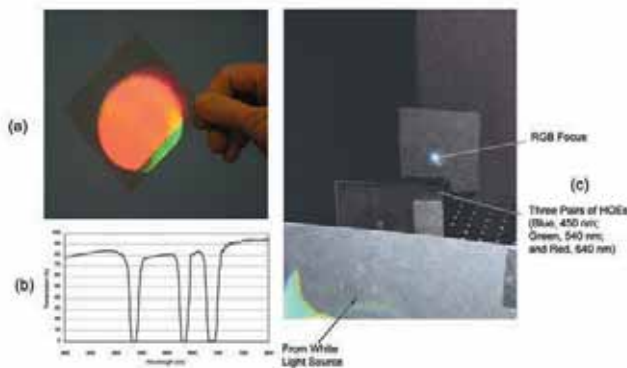
▲ Holographic A-band Multi-channel Substrate Guided Wave-based Spectrometer (HAMSS)



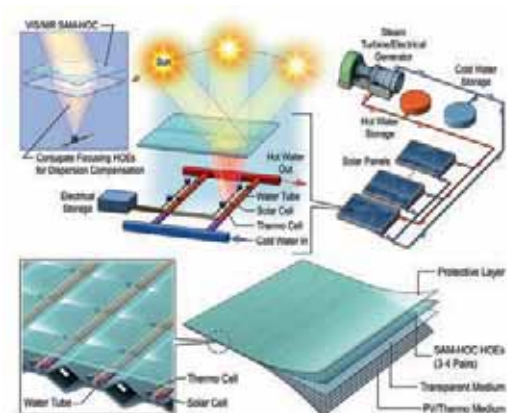
▲ Holographic Waveguided See-through Display (HOWSD)



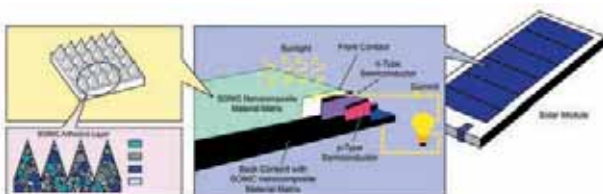
▲ Integrated Spatial Filter Array (ISFA)



▲ Spectrum Splitting Holographic Concentrator (SHOCC)



▲ Solar Photovoltaic Holographic Cogeneration (SPHOC) System



▲ Multifunctional UV-curable SolGel-Organic Hybrid Nanocomposite Encapsulating System (SONIC)

# CAPABILITIES



## 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/cell phone backlights, scanners and machine vision applications.



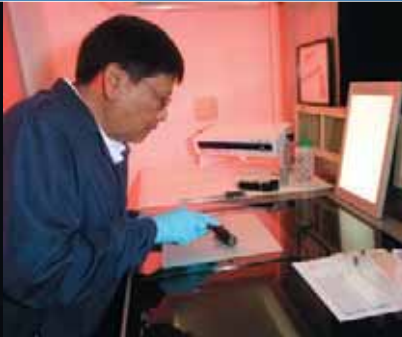
## Clean Rooms

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



## Holographic Mastering

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



## Custom Replication

LSD diffusers or custom micro-structures can be directly replicated onto a variety of substrates, lenses and optical components.



## Glass-On-Glass

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



## Mass Production

Replication of thin film and rigid panels utilizing custom designed high volume equipment.



## Embossing

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



## Cut to Print Silk Screened

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



## Surface Protection

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



Tel (310) 320-1066 | Fax (310) 320-8067  
1850 West 205 Street | Torrance, CA 90501  
[www.LuminitCo.com](http://www.LuminitCo.com)

