

The Illuminator

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OptiCAD® 8.0

Detector Launched
Radiometric Raytracing
and Synthetic Imaging

EquationCAD™ Equation
Based CAD Surface Creator

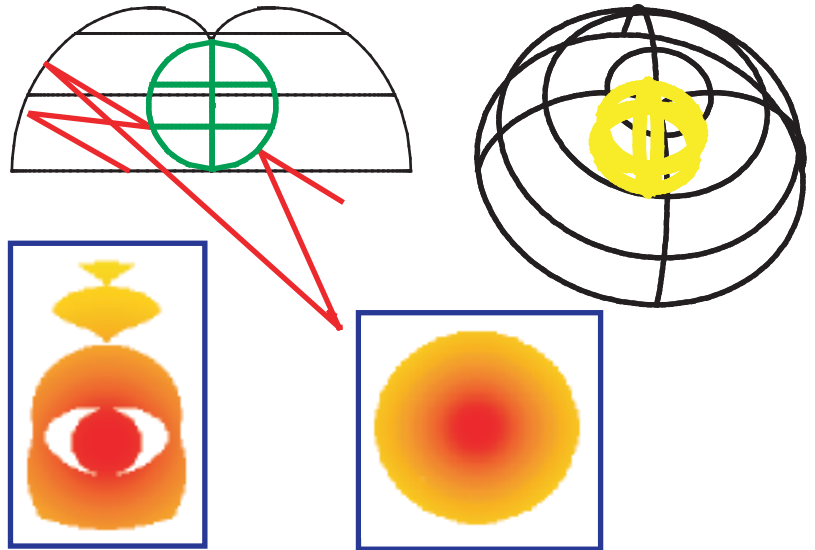
Displays Photometric and
Radiometric Units

Sun Source

Spherical Surface Source

Aspheric Cylindrical Surface

Glued NURBS Surfaces.



An involute reflector created in EquationCAD and a spherical luminous surface (top figures) are analyzed using radiometric rays launched from a detector. The lower right figure shows a simulation of an on-axis view looking into the reflector, the lower left figure shows a simulation of a view from 30 degrees.

Detector Launched Radiometric Raytracing and Synthetic Imaging

Detector launched radiometric raytracing (also called reverse raytracing) traces rays from a detector-source towards all objects and surfaces. Any surface can have an irradiance (watts/cm^2 or Lumens/m^2) assigned. These rays are traveling power buckets, accumulating power from surfaces having a non-zero irradiance along their paths, while undergoing refraction, reflection, transmission, absorption, splitting, and scattering. The sum of these rays is an approximation to a radiometric integral. A detector-source can be a cone of rays, or any of the OptiCAD source dlls allowing a surface or volume average calculation. A synthetic imaging camera is a virtual (flat or spherical) focal surface attached to a detector. Detector launched radiometric rays launched from a detector are back projected onto this surface, and the accumulated power of the ray is added into an element of a two-dimensional array on the surface. Rays launched from a single point on the detector represent a pinhole camera, while rays launched from a surface can be used to simultaneously image the entire field of view of an optical system.

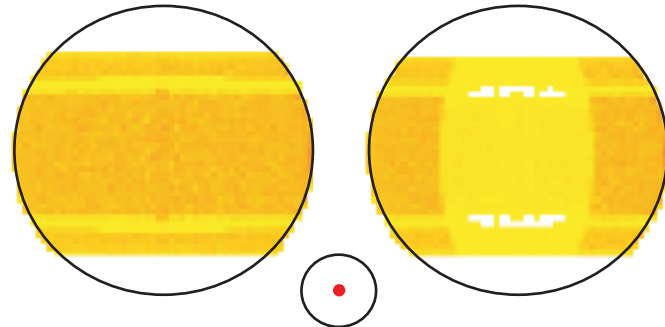
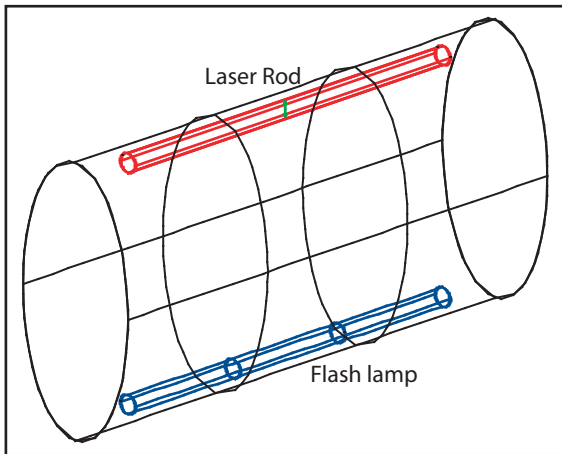
How to Upgrade to the New OptiCAD 8.0

Users covered by a current OptiCAD annual technical support agreement will receive Version 8.0. If your support agreement has expired, this would be a good time to upgrade. The expiration date is shown in the upper right hand corner of your mailing label. To renew your support agreement and receive a copy of Version 8.0 of OptiCAD as well as one year of technical support, contact us at (505) 995-1999, or sales@opticad.com. We accept prepayment, Visa, Master Card, Amex, and Discover.

Equation Based CAD Surface generator

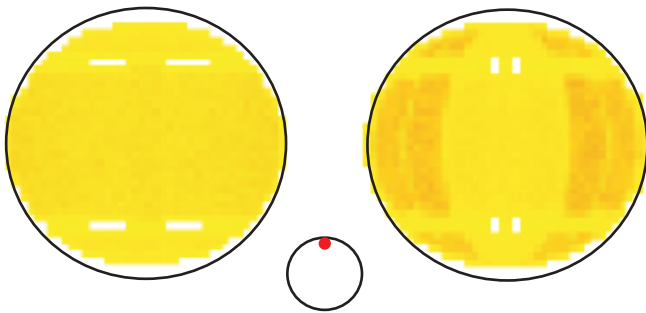
EquationCAD is a stand-alone Windows program that translates a surface equation into a CAD surface. The **Non-Uniform Rational B-Spline** CAD surface can then be imported into OptiCAD or any other program that accepts an IGES 3-D CAD surface. Surfaces can be specified by: selecting a surface by name and entering coefficient values; typing in an equation with variable, functions, powers, and coefficient values; referencing an external file containing coefficient data. The surface can be trimmed (limited in extent), viewed in real-time, and saved for reuse. Surface can be scaled in x, y, and z. User has control over number of sample points and fit order. EquationCAD is produced by EquationCAD Corporation and distributed by OptiCAD Corporation.

Detector Launched Radiometric Raytracing and Synthetic Imaging Used to Analyze Laser Rod Pumping Uniformity

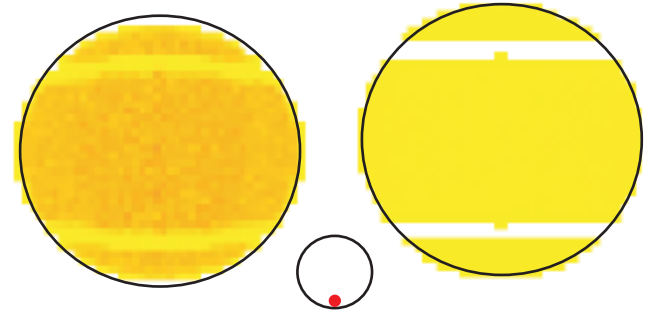


A laser rod is centered at one foci of an elliptical cylinder and a flash lamp at the other foci. While a line at one foci is imaged perfectly to a line at the other foci, both the rod and the lamp are of finite diameter. In order to analyze the uniformity of pumping, we trace a full sphere of rays originating from several points in the rod. The rays accumulate power when hitting the flash lamp. The rod has a volumetric absorptance and the elliptical cylinder has a surface absorptance. Views are displayed on a hemispherical focal surface, total power is in units of watts per unit volume, total lamp power is 5,000 watts. *Red dot shows location of observer.* Some rays: never leave the rod, never reach the lamp, or pass through the rod more than once.

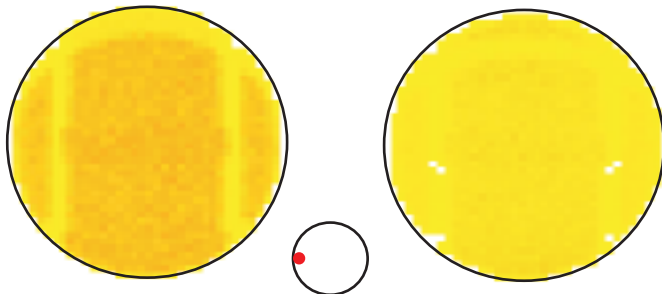
Above: Left view is looking down (total power is 23), right view is looking up (total power is 17).



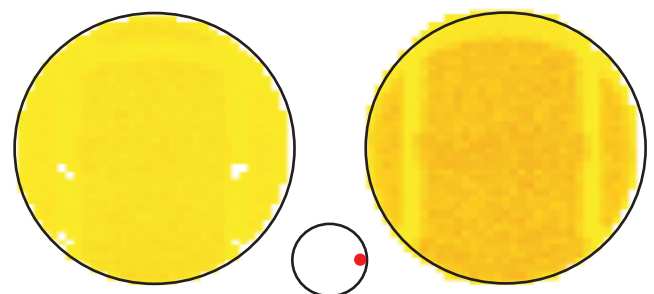
Above: Left view is looking down (total power is 7), right view is looking up (total power is 10).



Above: Left view is looking down (total power is 19), right view is looking up (total power is 1).

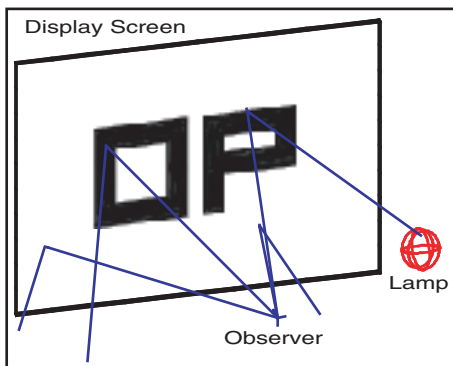


Above: Left view is looking left (total power is 17), right view is looking right (total power is 5).

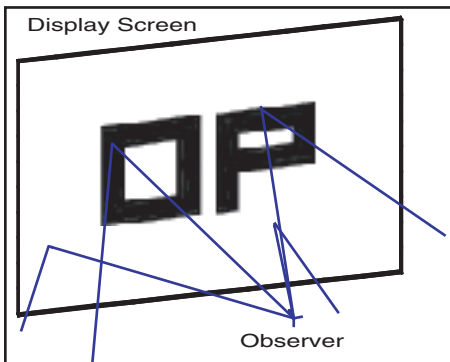


Above: Left view is looking left (total power is 5), right view is looking right (total power is 17).

Detector Launched Radiometric Raytracing and Synthetic Imaging Used to Analyze Displays



Rays launched from a detector (observer) accumulate power along their paths. Backlit display (above left) includes a lamp located behind the observer. Some reflected rays strike the lamp and accumulate additional power. Middle image shows the result of a point source (pinhole camera), a ray intersects (samples) the center of each array element on a flat focal surface. Right image shows the result of a Lambertian disk source behind a lens. Rays are back propagated to and are displayed on a spherical focal surface, allowing the entire field of view of a lens to be imaged simultaneously. Any OptiCAD custom source can be used in this manner. Both images show the direct reflection of the lamp and a weaker reflection due to multiple reflections inside the display material.

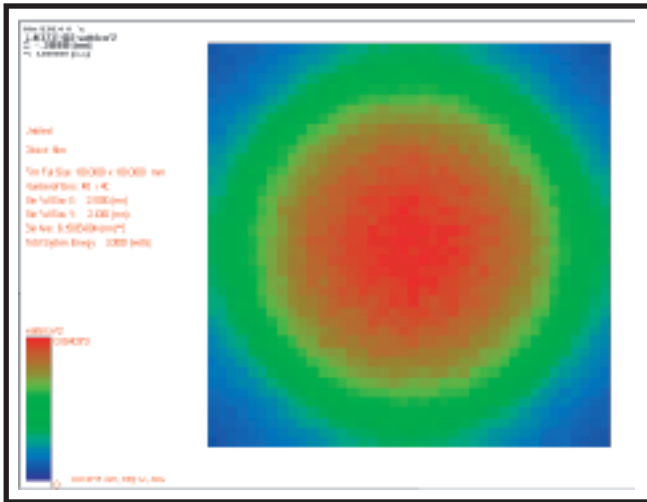


Edge lit display (above left). Middle and right images show results of a Lambertian disk source behind a lens when projected onto a flat and spherical focal plane.



Same display shown at various view angles. Middle middle image is 0 degrees. Left image is 45 degrees horizontal (head moving sideways), total received power is 70% of 0 degree case. Right image is 45 degrees vertical (partially closing a laptop computer), total receive power is 60% of 0 degree case.

Photometric/Radiometric Units

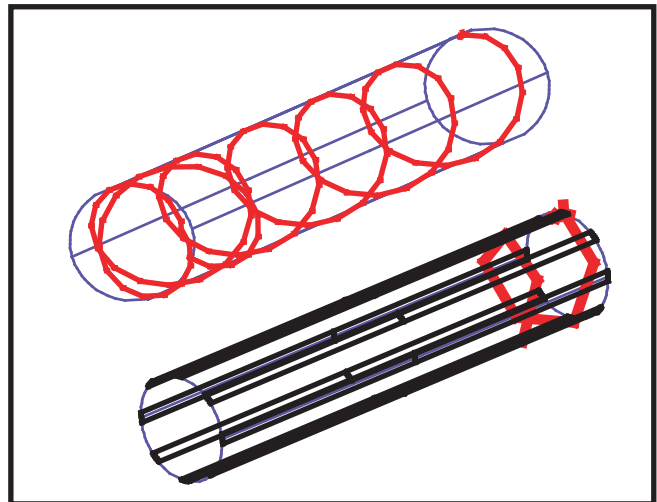


Radiometer displays irradiance in either watts/cm² or lumens/m². Moving the cursor over the display shows the irradiance in that array element. Encircled energy and polar plots also displays radiometric or photometric units.

Glued NURBS

A NURBS surface can now be glued to either a native OptiCAD surface or to another NURBS surface. This allows the construction of more sophisticated hybrid objects.

Amplified Spontaneous Emission



Some of the spontaneously emitted power inside a laser rod can become trapped (top figure), amplified, and not usable.

A laser rod is modeled with a single pass small signal gain of 100. In order to suppress the total power that is either trapped or escapes, eight absorbing strips ("spoilers" shown in the bottom image) are attached to the rod. These strips represent 26% of the area of the cylinder part of the rod (lower figure). Evaluation traced 1,000,000 rays, allowing up to 10,000 bounces.

OptiCAD

Illumination - Radiometry - CAD - Visualization Software.

OptiCAD	\$3,500.00
OptiCAD Support/Upgrades	\$750.00
EquationCAD	Included (free) with OptiCAD and OptiCAD Upgrades
Shipping, North America/International	\$20.00/40.00

Prices are good through December 31, 2002. Prepaid orders, Visa/MasterCard/AMEX/Discover accepted. Checks must be payable in US. dollars drawn on a US. bank. Customers are responsible for any duties and taxes. New Mexico customers add applicable state sales taxes. OptiCAD is a trade name of OptiCAD corporation. EquationCAD is a trade name of EquationCAD Corporation. Copyright 2002.

