

INTRODUCTION

What OptiCAD Is

OptiCAD is a computer program for the layout and analysis of three-dimensional optical systems. The program is structured in a computer-aided design (CAD) format in which the user defines objects, then places and orients them in a global-coordinate system. The program may be used to simulate a wide variety of nonimaging and imaging optical systems.

Components include spherical and cylindrical lenses; conical, parabolic, elliptical, spherical, and flat mirrors; full (closed) cylinders and ellipsoids; transmitting and reflecting rods; parabolic and elliptical troughs; single- and double-sided reflective surfaces; apertures of finite extent; lightpipes; multiple sources and detectors; compound parabolic concentrators; Fresnel lenses; and polygonally faceted objects (that may be translated from a CAD program).

All surfaces may be modified in reflectance and absorptance; oval or rectangular holes may be added in many surfaces; diffraction gratings and polynomial aspherics may be added to many surfaces.

OptiCAD has several forms of diffuse surface scattering that may be applied to any surface and a radiometry feature with no ray limit.

A powerful feature of OptiCAD is unconstrained (nonsequential) ray-tracing. Rays are not constrained as to the order in which components are intersected, nor to the number of times the same component may be intersected. The optical system is not constrained to any rotational symmetries. Total internal reflections (TIR) are handled automatically.

The results are presented as tabular output, 3-D graphical views of the system (with or without rays), ray-spot diagrams, encircled and enslitted energy plots, rendered images (solid model display), 2-D irradiance maps, and for some data in a form that can be imported into a spreadsheet program.

What OptiCAD Is Not

OptiCAD does not perform optimization; it is an analysis-only program. OptiCAD does not perform any diffraction calculations; it is a geometric ray-trace program.

Applications for OptiCAD®

- Parabolic shaped concentrators
- Arbitrarily shaped concentrators
- Light pipes of any shape or complexity
- Automobile instrument and display panel lighting
- Display panel lighting
- Illumination systems, headlights, taillights
- Conventional optics, including lenses, mirrors, prisms, beam splitters
- Luminaires
- Laptop computer displays
- Slide and television projectors
- Flow cells, and other biomedical instruments
- Uniform illumination reflectors
- Stray light analysis, baffle design, optical scanners
- Flashlamp and diode pumped lasers
- Grazing incidence conics
- X-ray telescopes
- Reflective highway markers
- Solar collectors
- Axiconal optics
- Unusual optics and lenslet arrays
- Fiber optical design and multimode fibers
- LCD backlighting and projectors
- Ghost and narcissus analysis
- LED and laser diode systems
- Arc lamps
- IR imaging and detection systems
- Lithography and rapid annealing systems

OptiCAD® Analysis

OptiCAD® features a truly unconstrained non-sequential ray trace engine. Simply place the sources anywhere in 3D space, and OptiCAD determines where the rays go! OptiCAD supports numerous tools to analyze the optical system including:

- Isometric and arbitrary angle 3D views
- 3D ray trace views
- Sobol & Monte Carlo rays
- Spot diagrams
- Energy plots
- Intensity maps
- Irradiance & illuminance maps
- Radiance & brightness maps
- 3D Solid display
- 3D Global coordinate system
- Polar and polynet radiometers
- Visualization ray tracing, displaying what an observer actually "sees"
- Data exportable as spread sheet (csv) or bitmap

OptiCAD® Sources

OptiCAD® supports integrated and user defined sources. Multiple sources can be combined anywhere in a 3D geometry. Multiple sources may even be placed inside a complex object.

- Point sources
 - Equal angle, equal solid angle, equal tangent, and equal direction cosine ray bundles (grids)
 - Isotropic
- Surface or Volumetric sources
 - Collimated rectangular or elliptical
 - IESNA lamp data
 - Radiant Sources
 - Diode and diode arrays, Gaussian, multi-mode gaussian, isotropic, lambertian, toroidal, helical, sun, spherical surfaces and solids, cylindrical surfaces and solids, and ellipsoidal solids
 - Tabulated ray data
- User defined sources
 - Arbitrary via external DLL
 - 3-D spatial equation
 - Spatial bitmap
 - Angular equation
 - Angular data table

