



# LED Fundamentals

## Optical and Lighting Software

01-03-2012

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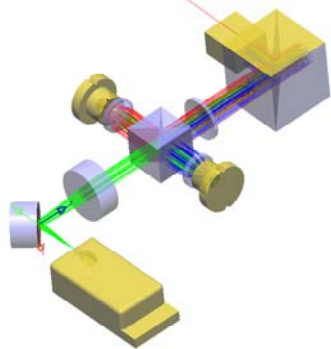
Hello and welcome to this presentation on Optical and Lighting Software, part of OSRAM Opto Semiconductors' LED Fundamentals series.

In this presentation we will look at the differences between optical and lighting software, when each type of software should be used, and appropriate light source models for each software type.

## What is the Difference Between “Optical Software” and “Lighting Software”?

### Optical Software

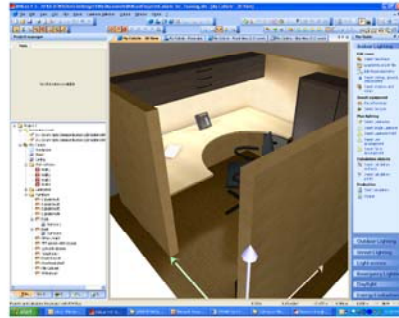
High-end software packages  
Design & analysis of optical system  
Raytrace  
Precision  
Package-specific rayfiles



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### Lighting Software

Lighting design; look & feel of the scene  
Analysis of application  
Speed  
IES or Eulumdat distribution files



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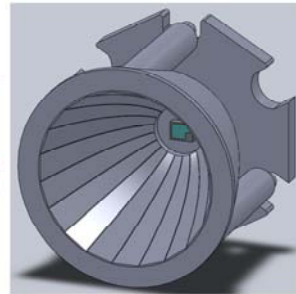
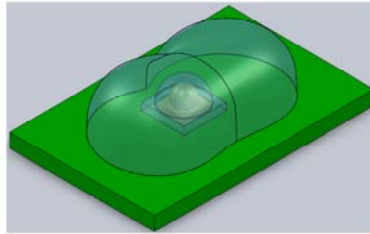
Optical software is used to design optics and optical systems, model optical effects according to the laws of physics, and use precision source models, such as rayfiles.

Lighting software is used to model the application environment, such as a roadway or room. Assumptions are made about optical properties in order to speed calculations. The light source models only contain intensity vs angle information and can be anything from a lighting fixture to an individual LED. While optical software can perform the same functions as lighting software, lighting software can produce results much faster.

## When do I Need Optical Software?

### Optical Software

- Design optical elements (lenses, reflectors)
  - Design & analysis of complete optical system
  - Surface treatments
  - Materials
  - Lit appearance (glare)
- Raytrace  
Package-specific rayfiles



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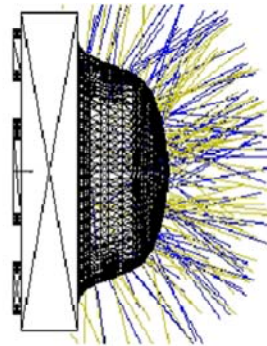
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Optical software is needed to design the individual optical elements in your system. It is also needed to model the effects of different optical surfaces and materials, and to make realistic predictions about lit appearance. Optical software requires detailed source models, such as rayfiles, for accurate results.

## What are Rayfiles?

Tabulated data with the properties of each ray exiting the LED:

- Coordinates of the ray starting point (x, y, z)
- Direction of the ray (kx, ky, kz)
- Power/flux of the ray
- For some optical software, the wavelength of the ray



An LED rayfile contains detailed information about the source. Each ray in the file contains its starting coordinate, ray vector, optical power, and in some cases, the wavelength.

## How are Rayfiles Generated?

Rayfiles are generated in one of two ways:

### Simulation

Optical model which considers:

- Bi-directional Scattering Distribution Functions (BSDF's) of package materials
- Chip emission patterns
- Complex geometrical features within the LED package
- Mie scattering of diffusers
- Wavelength conversion by phosphors

### Measurement

Rayfile created via:

- Using a near-field goniometer
- Luminance pictures are measured from various angles around the LED
- Using a special algorithm, the collection of luminance pictures are converted to rays
- Ray data is converted to rayfiles of different software format.

Rayfiles are generated through either computer simulation or measurement.

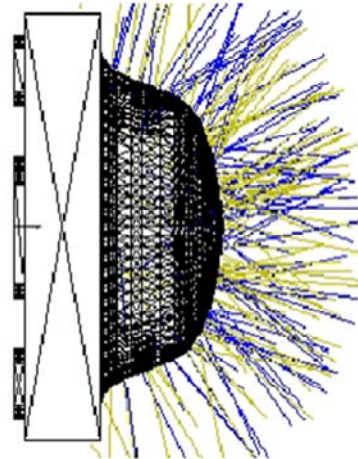
## How are Rayfiles Generated?

Rayfiles are generated in one of two ways:

### Simulation

Optical model which considers:

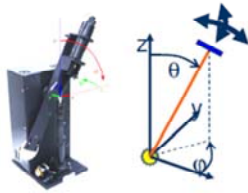
- Bi-directional Scattering Distribution Functions (BSDF's) of package materials
- Chip emission patterns
- Complex geometrical features within the LED package
- Mie scattering of diffusers
- Wavelength conversion by phosphors



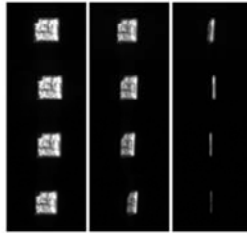
For simulation, a complicated model is built and raytraced in optical software. Detailed optical properties and physical phenomena must be considered.

## How are Rayfiles Generated?

Rayfiles are generated in one of two ways:



Near field goniometer set-up



Luminance pictures taken at different viewing angles  $\theta$ ,  $\phi$

### Measurement

Rayfile created via:

- Using a near-field goniometer
- Luminance pictures are measured from various angles around the LED
- Using a special algorithm, the collection of luminance pictures are converted to rays
- Ray data is converted to rayfiles of different software format.

For measured data, a near field goniometer is used to measure the light distribution of the LED. A collection of luminance images is recorded and converted into ray data suitable for use with a number of different software brands.

# Rayfiles Online

<http://catalog.osram-os.com>

Click on "Ray Files" icon

LED (Light Emitting Diodes)  
Silicon Photodetectors  
Optical Sensors  
Infrared Emitters  
High-Power Laser Diodes  
Visible Laser  
Intelligent Displays  
Discontinued Products

Home

Product Catalog  
Optoelectronic Semiconductors

Related Product Groups

- LED (Light Emitting Diodes)  
SMD and through-hole packages in all visible colors
- Silicon Photodetectors  
Photoresistors, PHS Photodiodes, Photo IC
- Optical Sensors  
SMT Reflective Sensors and Slotted Interrupters
- Infrared Emitters  
850nm, 880nm, 940nm and 950nm wavelength
- High-Power Laser Diodes  
Single emitters and laser bars
- Visible Laser  
Lasers emitting visible light in miniature packages
- Intelligent Displays  
Intelligent displays with superior readability, available in all visible colors
- Discontinued Products  
Leaded Product Types

Parametric Search  
Search for technical parameters

Light Shop  
24 hrs. Shopping Worldwide.  
Click on the banner to get to our Light-Shop, where you can order our products from our distribution partners Digi-Key and RS Components.

Application Notes

Ray Files

Related Links  
OSRAM Opto

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Rayfiles for OSRAM Opto Semiconductors' LEDs can be found on our website by following the links shown here.



## Rayfiles Online

Home / Application Support / Optical Simulation / LED / OSLO / OSLO SSL / LUW\_CQDP\_EGW

**IR**

**LED**

- 3mm (T1) LED
- Advanced Power TOPLED
- Advanced Power TOPLED Plus
- CERAMOS
- CHPLED
- DURIS
- Diamond DRAGON
- Golden DRAGON
- Golden DRAGON Plus
- Golden DRAGON oval Plus
- MULTLED
- Micro SDELED
- Mini TOPLED
- OSLO
- OSLUX
- OSRAM OSTAR
- Platinum DRAGON
- PointLED
- Power TOPLED
- SDELED
- SmartLED
- Special
- TOPLED
- Ultra Flux LED

**Optical Simulation**

Ray files / Distribution files

Title	File Type	File Size
<a href="#">rayfile_LUW_CQDPeqw_070711_ASAP.zip</a>	ZIP	247 MB
<a href="#">rayfile_LUW_CQDPeqw_070711_ASCB.zip</a>	ZIP	216 MB
<a href="#">rayfile_LUW_CQDPeqw_070711_EULUMDAT.zip</a>	ZIP	536 KB
<a href="#">rayfile_LUW_CQDPeqw_070711_ES.zip</a>	ZIP	536 KB
<a href="#">rayfile_LUW_CQDPeqw_070711_LIGHTTOOLS.zip</a>	ZIP	209 MB
<a href="#">rayfile_LUW_CQDPeqw_070711_LUCIDSHAPE.zip</a>	ZIP	247 MB
<a href="#">rayfile_LUW_CQDPeqw_070711_OSRAM.zip</a>	ZIP	248 MB
<a href="#">rayfile_LUW_CQDPeqw_070711_Photopia.zip</a>	ZIP	247 MB
<a href="#">rayfile_LUW_CQDPeqw_070711_SIMULUX.zip</a>	ZIP	247 MB
<a href="#">rayfile_LUW_CQDPeqw_070711_SPEOS.zip</a>	ZIP	283 MB
<a href="#">rayfile_LUW_CQDPeqw_070711_TraceProBinary.zip</a>	ZIP	247 MB
<a href="#">rayfile_LUW_CQDPeqw_070711_ZEMAX.zip</a>	ZIP	247 MB

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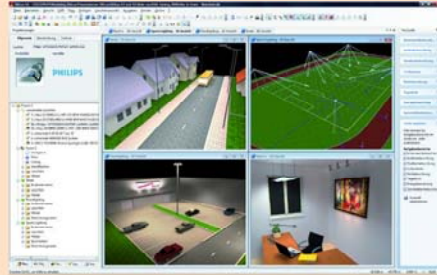
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Once you have navigated to the rayfiles of your LED of interest, you will see links to a number of ZIP files. Each ZIP file contains ray data in a different software format. In addition, each ZIP file contains an informational document, 3-D CAD data, and in some cases, spectral information and library files.

## What can Lighting Software do for me?

Create any lighting scenario using OSRAM Opto Semiconductors LEDs as the light sources or in a fixture.

- Full software for calculating lighting layouts
  - Create detailed interior and exterior illuminated scene models
  - Create detailed lit renderings
  - Calculate lighting levels on all surfaces



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“Lighting software” is used to demonstrate the performance of your fixture or prototype within the application environment. It calculates illuminance and luminance values throughout the scene, and can produce high-quality lit renderings. Both interior and exterior scenes can be created.

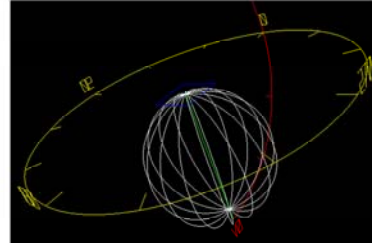
## What are IES Files?

### IES file

- Illumination Engineering Society
- Photometric data (intensity in candela vs. angle)
- ASCII text file, file extension \*.ies
- Commonly used in North America

### Eulumdat file

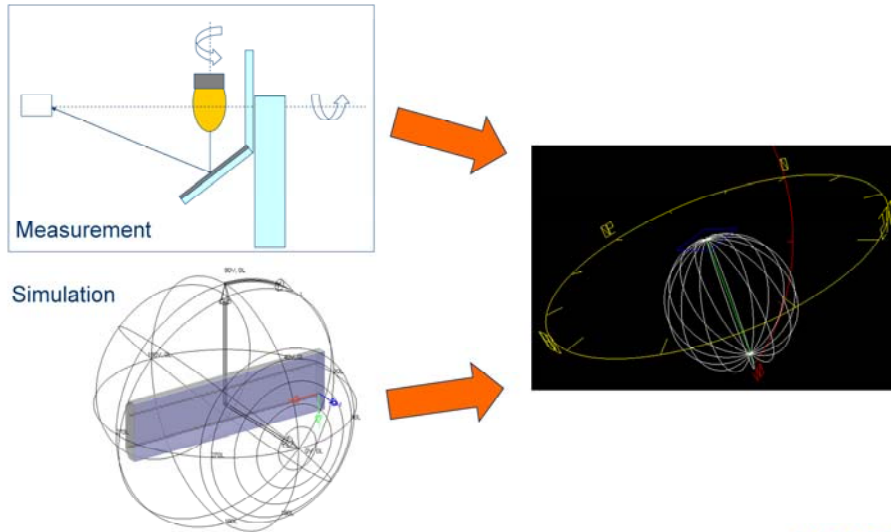
- European version of the IES file
- File extension \*.ldt



For lighting software, the light source files are either IES or Eulumdat files. An IES file contains intensity vs angle data for the light source, which can be anything from a single LED to an entire fixture. This ASCII text file is in a standard format developed by the IESNA, and is commonly used by North American fixture manufacturers to distribute photometric information.

An Eulumdat is similar to an IES file in that it is also a text file with intensity vs angle information, but the formatting is different. The Eulumdat format is typically used in Europe.

## How are IES Files Generated?



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Like rayfiles, IES files are generated through either computer simulation or measurement. For simulation, a detailed model is built and raytraced in optical software, and the output data is structured into IES format. For measured data, a far field goniometer is used to measure the light distribution.

**IES files for Individual LEDs**

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PRODUCTS APPLICATION SUPPORT SALES CONTACTS

Application Notes Optical Simulation Thermal Simulation Electrical Simulation Packag

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**LED**

- 3mm (T1) LED
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- Advanced Power TOPLED Plus
- CERAMOS
- CHIPLED
- Diamond DRAGON
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- MULTILED
- Micro SIDELED
- Mini TOPLED
- OSL ON
- OSLUX
- OSRAM OSTAR

**Optical Simulation**

Ray files / Distribution files

Files

Title	Size	Download
> preliminary_rayfile_LUW_CPDP_221010_A_SAP...		
> preliminary_rayfile_LUW_CPDP_221010_A_SCR...		
> preliminary_rayfile_LUW_CPDP_221010_Eulum...		
> preliminary_rayfile_LUW_CPDP_221010_IES.zip		
> preliminary_rayfile_LUW_CPDP_221010_Lighttools.zip	201 MB	

**EULUMDAT & IES files**

OSRAM LED in EULUMDAT format  
Download (zip), 35 MB

OSRAM LED in IES format  
Download (zip), 33.9 MB

**EULUMDAT & IES files ordered by products**

- 3mm (T1) LED
- Advanced Power TOPLED
- Advanced Power TOPLED Plus
- CERAMOS
- CHIPLED
- Diamond Dragon
- Golden Dragon
- Golden Dragon Plus
- Golden DRAGON oval Plus
- MULTILED
- Micro SIDELED
- Mini TOPLED
- OSLON Family
- OSLUX
- OSRAM OSTAR Family
- Platinum Dragon
- PointLED
- Power TOPLED
- SIDELED
- SmartLED
- Special
- TOPLED
- Ultra Flux LED

LED Light for you  
powered by OSRAM

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IES and Eulumdat files for OSRAM Opto Semiconductor LEDs can be found along with our rayfiles. They can also be found on OSRAM's LED Light For You website.



**Thank you for your attention.**

Please refer to the application note “**Importing OSRAM Opto Semiconductors Rayfiles**” on the main OSRAM website for additional information.

Thank you for viewing this presentation by OSRAM Opto Semiconductors.

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