How to Use Osram LED data with ZEMAX

http://www.zemax.com/kb/articles/178/1/How-to-Use-Osram-LED-data-with-ZEMAX/Page1.html
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LED manufacturer Osram Opto Semiconductors now makes comprehensive ray-tracing data for its range of products available free of charge in ZEMAX format. This article explains how to access and use that data.

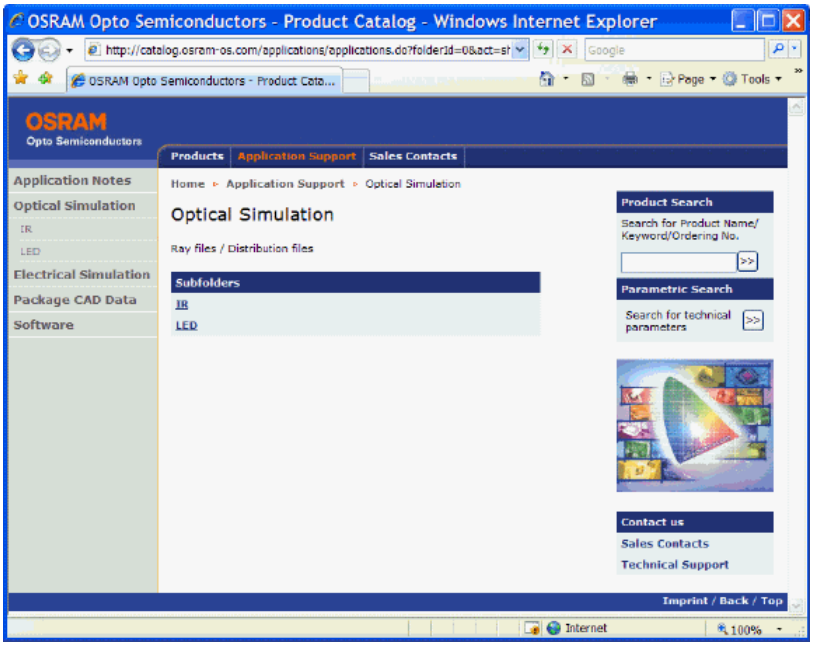
This article is also available in Japanese.

Introduction

This article is also available in Japanese.

LED manufacturer Osram Opto Semiconductors now makes comprehensive optical performance data available in ZEMAX format, at no charge.

You can find this on the Osram website under http://www.osram-os.com/ and following the links Products -> Product Catalog -> Application Support -> Optical Simulation. Alternatively, use this link to go straight there. (Both links will open a new browser window or tab.)



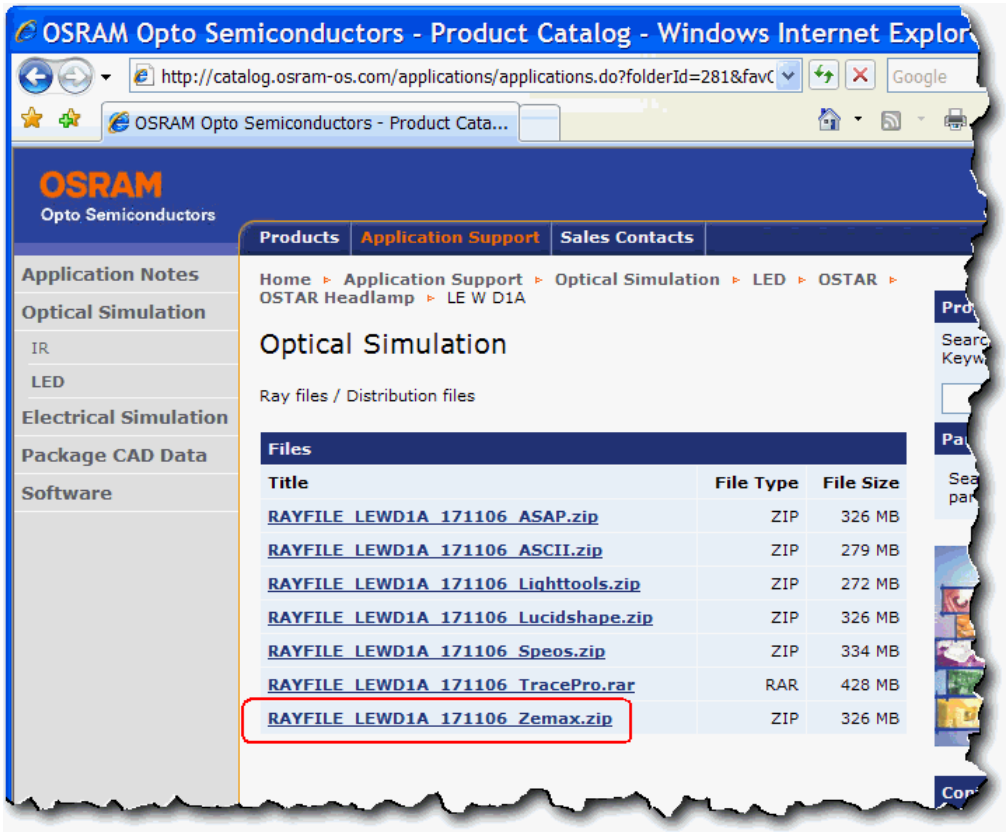
Once there, follow the IR or LED links to locate the source you need. In this example, we will download the data for the LE W D1A device. This device is used for a wide range of applications, such as floodlights for workplace illumination, automotive headlamps, medical lighting, surgery lighting, microscope illumination, spotlights, variable message signs and high end strobe lights.

The product is supplied mounted on a printed circuit boad. with all necessary electrical connectors.

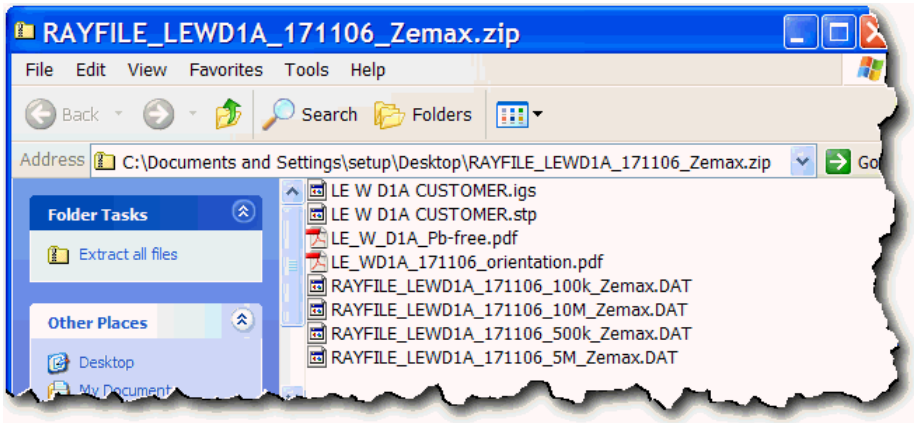
Importing the data

See How to Model LEDs and Other Complex Sources for full details of the procedures described here.

Navigate in the Osram website until you locate the device you are interested in. In this case, it is the OSTAR LE W D1A device:



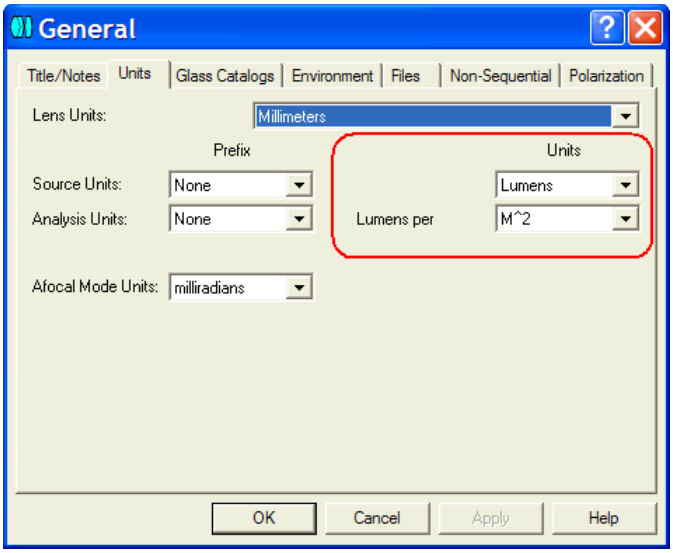
Download the ZEMAX format data ZIP file from the site. Here are its contents:



The .igs and .stp files are mechanical CAD files that you can read into ZEMAX using the Imported Object. The .pdf files are datasheets and orientation drawings. The .DAT files are the ray data files, and are read into ZEMAX using the Source File object. Four data files are provided in this case, containing 100k rays, 500k ray, 5 million rays and 10 million rays each.

The wavelength of the source, and its total power, are not contained in the .dat files. The wavelength is entered via the Wavelength dialog box. As this is a white light source, I chose a wavelength of 0.555 microns, as this is the peak of the human visual response curve, and this LED is mainly used for lighting applications.

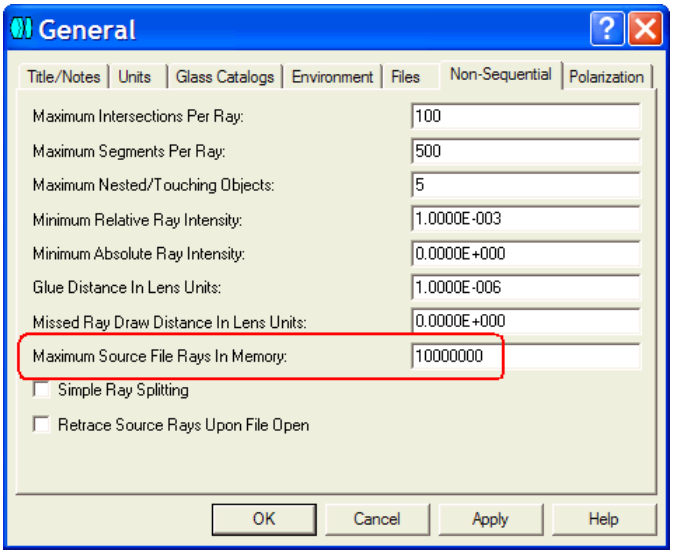
Under General...Units we set the system units as follows:



The luminous flux of the LED is measured in units of Lumens so we choose that unit for this simulation. Illuminance is therefore measured in terms of lm/m^2, or Lux. Luminous intensity ("brightness") is measured in lumens/steradian or Candela (Cd). Luminance is measured in lm/m^2/sr, or Cd/m^2, which is sometimes referered to as a nit.

For many of the white-light LEDs, Osram provides not just the white combination rayfile, but two rayfiles for blue and yellow (due to the emission characteristic of the white generation converter material). Osram choose the wavelengths to be 460nm and 570nm. This will require two Source File objects, one for each wavelength. Flux contributions (in photometric units!) are 0.028 lm blue and 0.972 lm yellow for a total flux of 1lm.

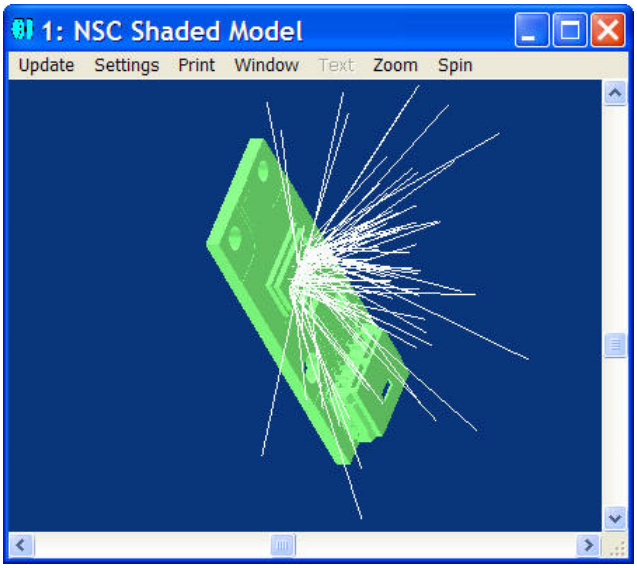
For source datafiles, if the total number of rays to be traced is less than the maximum number of source rays in memory, ZEMAX stores the rays in system memory for maximum speed.



This requires about 28 bytes of memory for each ray, or up to 28 Mb of memory for 1,000,000 rays. If the total number of rays is greater than the maximum number of source rays in memory, ZEMAX leaves the ray data on disk, and reads the file as required. This requires less memory, and allows ZEMAX to trace a huge number of rays, limited only by the systems file storage capacity.

The data in the zip file should be unzipped and placed in the {zemaxroot}/objects folder. Use of the CAD file is optional: if the rays can be retroreflected back onto the LED or PCB assembly, and this causes significant optical effect, the CAD object should be included, otherwise it can be safely omitted. (Note that the data file already includes any interaction of the optical source with the PCB assembly, so you only need to include the PCB assembly if your optical system reflects significant light back into the PCB.)

Here is the data, showing both the Imported CAD object and the source file:



See this article if you need to define multiple optical properties on the imported CAD object. After ray-tracing the Analysis rays, a detector viewer shows: