

**SYNOPSYS™** Lens Design Software

# Feature Profile Booklet

# SYNOPSYS™ Lens Design Software

**Optical Systems Design (OSD Optics)**, a Software and Engineering Service company, is the provider of the SYNOPSYS™ Lens Design Software. SYNOPSYS™ was first launched about 50 years ago, by Don Dilworth, an experienced Optical Designer. He created the name SYNOPSYS™ to stand for **SYN**thesis of **OP**tical **SY**stems. It is developed and updated continuously, with many features suggested by users.

Infusing optics knowledge with fast numerical algorithms, Don created many unique features in SYNOPSYS™:

- the powerful PSD (Pseudo-Second Derivation) algorithm that can reach deeper minima in the optimization space and at a faster speed.
- A set of versatile Automatic Design Search Tools, which help users find starting points for new designs quickly and explore the optical design space to discover new design forms. Sometimes the designs returned by the numerical algorithms present better performances not normally realized using conventional design protocols.

At OSD Optics, we strive to bring powerful and cost-effective software tools to the Optics community. We offer our SYNOPSYS™ Lens Design Software with a perpetual license at a reasonable price, because we think our fellow Optical Engineers deserve the peace of mind knowing that they will have continued access to SYNOPSYS™ once they pay for the license. Also, after the first year, SYNOPSYS™ technical support and updates are available for a realistic annual fee whenever you desire unlike others!

OSD is also the distributor of the newest non-sequential raytrace program, RayJack® One, published by Hembach Photonik, Germany. RayJack® ONE offers maximum flexibility and control over simulations -- the new tool for optical system analysis.

**SYNOPSYS™ is a trademark of Optical Systems Design LLC.**

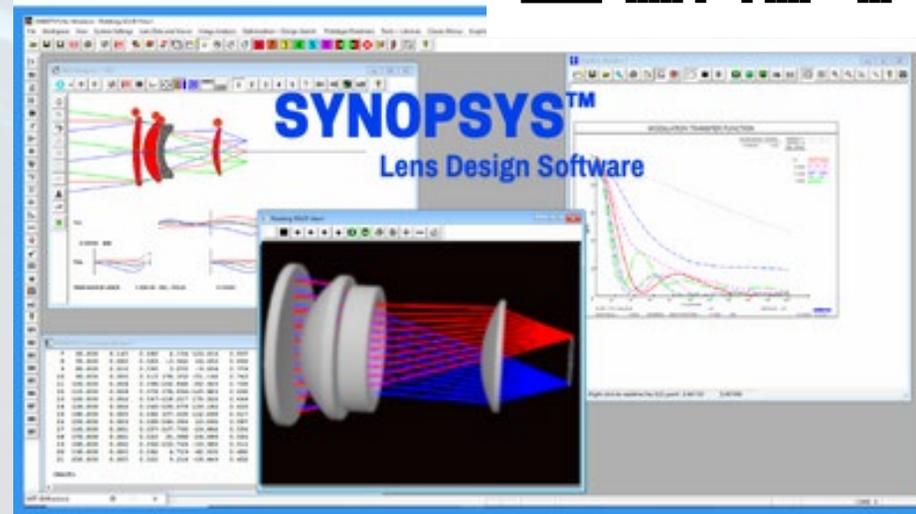
**OSD is NOT a reseller of CODE V, published by Synopsys®, Inc.; nor do we have any relationship with Synopsys®, Inc.**

# SYNOPSIS™ Lens Design Software



## Introduction

- **Cost-effective perpetual license**
- **Powerful optimization and versatile Automatic Design Search Tools**
  - Quickly find starting points for new designs
  - Explore the optical design space to discover new design forms
- **Fast and efficient optical design for demanding projects such as micro-lithography, zoom lenses, aspheric systems...**



**SYNOPSIS™** was first launched about 50 years ago, by Don Dilworth, an expert optical designer. He created the name **SYNOPSIS™** to stand for **SYN**thesis of **OPT**ical **SY**stems.

Video link: [SYNOPSIS™ Lens Design Software Overview](#)

# SYNOPSYS™ Lens Design Software



## SYNOPSYS™ Ui-Plus, Enhanced GUI

The Ui-Plus Edition of SYNOPSYS™ is released alongside with the long trusted Classic Edition that Don Dilworth created 50+ years ago.

In the UI-Plus Edition, we integrate all the features of the Classic version and wrap around it with an enhanced, streamlined, and workflow-oriented User Interface with the goals to assist new users to kickstart their designs with ease.

Enhanced, streamlined, and workflow-oriented User Interface

Video link: [SYNOPSYS™ UI+ Edition](#)

System Wavelengths

Wavelengths and Weights:

Use CdF lines

Enter Wavelengths and Spectral Weights:  
To analyze Third Order Color Aberrations, enter at least

Color Number	WA1	WT1	WA2	WT2
1	1.060000	0.001000		
2	0.986667	0.001000		
3	0.913333	0.001000		
4	0.840000	0.001000		
5	0.766667	0.001000		
6			0.693333	0.001000
7			0.620000	0.001000
8			0.546667	0.001000
9			0.473333	0.001000
10			0.400000	0.001000

Number of Wavelengths: 10

Weights of the present Wavelengths

Wavelength range from 0.400000 to 1.000000

Fast  
Powerful  
Cost Effective

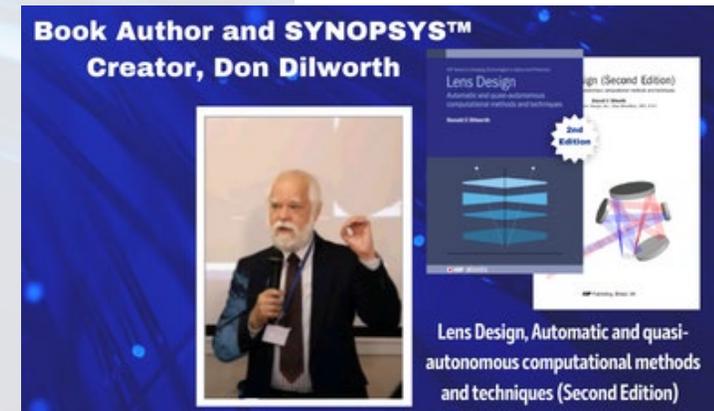
*"I really like the new UI version; I use it all the time. I often use the MTF Analysis... It's really nice that the dialog box stays active while I switch zoom positions so I can see and analyze at each zoom position with only 2 mouse clicks."*

# SYNOPSYS™ Lens Design Software



## Optical Design Books by Don Dilworth

- Discussion of powerful search routines that quickly produce excellent design starting points --Save you weeks of labor in doing so using conventional methods
- Explanation of the underlying design principles
- Examples include 12 element zoom lens, superachromatic telescope objective, eyepieces, infrared lenses, and more



*Lens Design, Automatic and Quasi-autonomous Computational Methods and Techniques (2<sup>nd</sup> Edition)*

The lens data files of design lessons in this book can be run in SYNOPSYS™ Lens Design Software.

Request the example design files at our website: [osdoptics.com/books](http://osdoptics.com/books)

# SYNOPSYS™ Lens Design Software

## AUTOMATIC DESIGN SEARCH TOOLS

**DSEARCH™**: find optimal starting points for fixed focus systems

**ZSEARCH™**: design Search tool for zoom lenses

The Automatic Design Tools in SYNOPSYS™ are created to provide an effective and practical solution to optical engineers:

- Ease the burdens in finding good starting points
- Efficient exploration of the design space to discover alternative design forms which may deliver better performances but not normally realized using conventional design protocols



*The innovative Automatic Design Tools in SYNOPSYS™ can help you find design starting points quickly for fixed focus and zoom lenses*

Video link: [DSEARCH and Tolerance Desensitization](#)

# SYNOPSYS™ Lens Design Software

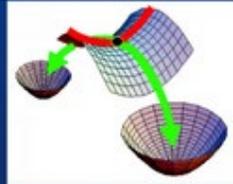


## Saddle-Point Method for Automatic Design

### Innovative Automatic Design Tools

- Saddle Point Build (SPBUILD): build up a complete system with no starting lens
- Augment an existing lens by adding or removing elements
  - AEI (Automatic Element Insert): scans lens system to find the best place to insert an element
  - AED (Automatic Element Deletion): helps you decide which element to remove without compromising system performance
  - AAA (Automatic Aspheric Assessment): assign unusual surface types such as aspheric or kino-form surface

Add degrees of freedom to your designs intelligently



### Saddle Point Method

Automatic Element Insertion (AEI)  
Automatic Element Deletion (AED)

*Comment from a real customer:  
“The automatic element insertion and deletion feature is one of the biggest differentiators from any other software in my opinion! It's a really powerful tool”*

Video link: [Saddle-Point Method](#)

# SYNOPTSYS™ Lens Design Software

## ZSEARCH: Design Search Tool for Zoom Lens

ZSEARCH helps you find good design starting points quickly for zoom lenses

Other convenient tools for zoom lens design in SYNOPTSYS™ :

- **CAM curve:** the Cam Curve construct in SYNOPTSYS™ can interpolate between the chosen zoom positions to determine the optimal in-between zoom placements for zoom range
- **ZoomSlider:** the ZoomSlider in SYNOPTSYS™ provides animated display of the continuous movements of lens groups and lens performance in the complete zoom range.



*Powerful Automatic Design Search Tool for Zoom Lenses*

Video link: [Automatic Design Search Tool for Zoom Lenses](#)

# SYNOPSYS™ Lens Design Software



## Ultra-wide Field System Design

Designing an Ultra-wide field system is not an easy task. In SYNOPSYS™, you can break the design process in two steps and complete the design with ease:

1. Design a front-end in real-time using the interactive WorkSheet lens editor to couple wide-field light into the system
2. Feed the front-end into the Automatic Design Search Tool (DSEARCH, unique to SYNOPSYS™), to find good design starting points for the rest of the system and complete the design.

With its powerful numerical algorithms, SYNOPSYS™ puts the fun back into designing, because the software does the work for you, so you can get difficult jobs done with ease and efficiency.

Video link: [Ultra-Wide filed DSEARCH](#)



*A 240° full FOV lens designed in SYNOPSYS™ using the DSEARCH (Automatic Design Search Tool) and WorkSheet. SYNOPSYS™ is intuitive; our Intern designed this difficult system in about 20 work hours, with no prior knowledge of wide-field design*

# SYNOPSYS™ Lens Design Software



## Freeform Build for Off-Axis Mirror Systems

Freeform Build (FFBUILD) in SYNOPSYS™ is a highly-automated tool developed for the design of compact off-axis freeform-mirror optical systems in 3D space

- Automatic Beam Clearance feature helps you easily lay out the system
- Easily adjust mirror angles to quickly optimize systems with different aspheric surface types



*An off-axis freeform mirror system designed using the Freeform Build (FFBUILD) feature in SYNOPSYS. This powerful tool makes it easy to design complex off-axis systems*

**FFBUILD (Freeform Build) tutorial for off-axis system design**

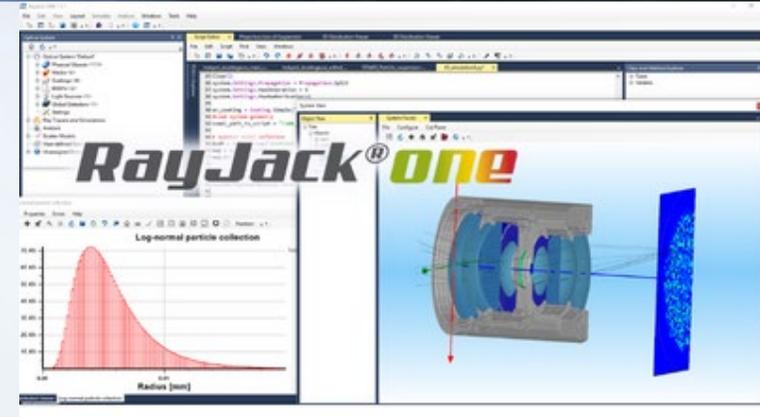
Designing free form off-axis systems is now easier than ever

Video link: [Freeform Mirror System with FFBUILD](#)

### New Non-sequential Ray Tracer

RayJack<sup>®</sup> ONE offers maximum flexibility and control over simulations; particularly suited for scientists and engineers who want to develop their own solution strategies.

- User interface built on the popular Python platform with syntax highlighting and auto-completion of commands
- Possibility to integrate freely available numerical libraries lead to an enormous increase in productivity
- Sophisticated and flexible detector concept, users can calculate standard quantities for radiometry or photometry, but also freely define their own measurement quantities



*RayJack<sup>®</sup> ONE builds on more than twenty years of experience in optical design and analysis. Funded by the European Space Agency ESA*



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To request a Trial or information  
[office@osdoptics.com](mailto:office@osdoptics.com)

<https://osdoptics.com/trial-request/>

