

#### **UA PRESENTATION - INTRODUCING OSLO 6.6**

8/24/2016



Confidential & Proprietary – Lambda Research Corporation

## **OSLO Videos on the Lambda Research Website**

#### **Interface and Overview Videos**

- **OSLO Overview** A high level overview of the interface
- Understanding and Using the OSLO Check Mark Keys to using the accept pending entry and cancel pending entry capability with spreadsheets
- OSLO Spreadsheet Hierarchy Discusses nuances with the spreadsheet hierarchy
- OSLO Lens Spreadsheet Presentation Effective use of the surface data spreadsheet
- OSLO Top Menu Explanation An overview of the graphics windows
- OSLO Graphics Window Details on the graphics window usage and output
- OSLO Text Window and Command Line Text window and command line usage



## **OSLO Videos on the Lambda Research Website**

#### **Effective Use, Macro Programming Videos**

- **Doublet Optimization Tutorial** A set of three videos and an interactive tutorial to take a doublet from a blank page through optimization
- OSLO Catalog Lens Presentation Covers effective ways to use catalog lenses
- OSLO Catalog Lens Tutorial An interactive tutorial on using catalog lenses
- OSLO Text Editors Walk-through of the built-in text editors within OSLO
- OSLO Introduction to Modifying, Supplementing, and Programming An introduction to programming in OSLO
- OSLO Import CCL Into Notepad++ Importing the CCL Language into Notepad++



## **OSLO Manuals**

OSLO User Guide: - <u>http://www.lambdares.com/images/pdf/oslo-user-guide.pdf</u>

OSLO Optics Reference - <u>http://www.lambdares.com/images/pdf/oslo-optics-reference.pdf</u>



## **Step by Step Tutorials**

The <u>http://fp.optics.arizona.edu/sasian/opti517/</u>folder has multiple step by step tutorials:

- OSLO\_Your\_First\_OSLO\_Session.pdf Good place to start learning OSLO, introduces you to the interface with a spherical mirror example
- OSLO\_Schmidt\_Camera.pdf Demonstrates how to use OSLO by designing a Schmidt Camera Objective
- OSLO\_Tutorial\_Classroom\_Demos.pdf
- OSLO\_Tutorial\_Gaussian\_Beam\_and\_Fiber\_Coupling.pdf
- OSLO\_Tutorial\_Landscape\_Lens.pdf
- OSLO\_Tutorial\_Optimization\_OSLO\_Standard\_or\_Premium.pdf





#### **INTRODUCTION**



Confidential & Proprietary – Lambda Research Corporation

#### Introduction

- User Interface
  - Windows Topics
    - Menus
    - Toolbars
    - Main Window Types
      - Graphics
      - Text
      - Spreadsheet
    - Other Windows
      - Command Line
      - Database
      - Editors
      - Slider Wheel
      - Catalog Lens
      - Printing

- Setup
  - Preferences
  - Fonts
  - Mouse
  - Keyboard
- File and Program
   Information

# **Main Window Types**





## Menus

- Main Menu Structure
  - Operates similar to Microsoft menus
  - Configured in a\_menu.ccl
- OSLO Editor Menu (not UltraEdit or Notepad++)
  - File & Edit items only
  - Not user configured
- Popup Menus
  - Right-click (not user configured)
  - Attached to SS buttons (not user configured)
  - Attached to toolbars (user configured)



28 3-5 Telecentric projection lens [3-5 telecentric.len] - OSLO Premium Edition

File Lens Evaluate Optimize Tolerance Source Tools Window Help



## Toolbars



- Spreadheet Toolbar \_\_\_\_\_ (multiple rows)
- Graphics Toolbar (single row)
- Text Toolbars (multiple rows)
- OSLO toolbars are different from Microsoft:
  - Not dockable
  - Text buttons allowed in OSLO
  - Immediate tool tips
  - Configured in ...inc/a\_toolbar.h
  - Programmable in CCL





#### **Main Windows Styles**





## **Graphics Windows**



## **Text Windows**

- Up to 2 Text Windows
  - Optional toolbars
  - Variable width, variable height
  - Up to 2000 lines
  - Spreadsheet Buffer Support -
  - Right-Click Support
    - Windows Clipboard Support
    - Page or Terminal mode —
    - Optional Command Echo –
  - Text Output on/off preference

	Mtf Psf						
×LENS I No nam	DATA e						
SRF OBJ	RADIUS	THICKNESS 1.0000e+20	5 APERTU 0 1.000	RE RADI Oe+14	US (	GLASS SP AIR	E NOTE
AST	0.0	0.0	1.0	00000 A	s	AIR	
IMS	0.0	0.0	1.0	00000 s			
*REFRA SRF 0 1 2 *PARAX	CTIVE INDICE GLASS AIR AIR IMAGE SUR IAL SETUP OF	S RN1 1.000000 1.000000 FACE LENS	RN 0 1.000 0 1.000	2 000 000	RN3 1.000000 1.000000	VNBR 0.0 0.0	TCE 0.0 236.00000
Ent Jma FIELD	rance blam r ect num. ape ge num. aper	adius:* 1 rture: 1.0 ture: 1.0	1.000000 0000e-20	Image F-num Worki	axial raj ber: no E-numb	√ s∣ope: er:	1.0000e-20 0.0
Fie Gau CONJU	ld angle: ssian image GATES	* 5.7 height: -1.0	7296e-05 )000e+14	Objec Chief	t height: 'ray ims	neight:	-1.0000e+14 0.0
Fie Gau CONJUC Obj Gau Ove Par OTHER	ld angle: ssian image GATES ect distance ssian image rall lens le axial magnif DATA	* 5.7 height: -1.0 : 1.0 dist.: -1.0 ngth: 0 ication: 1	7296e-05 0000e+14 0000e+20 0000e+20 0.0 1.0000000	Objec Chief Srf Srf Tota Srf	t height: ray ims Print Wind Print Page Print Selec	neight: Dw	-1.0000e+14 0.0
Fie Gau: CONJUG Obj Gau: OVel Par OTHER Ent Lag Eff	ld angle: ssian image GATES ect distance ssian image rall lens le axial magnif DATA rance pupil range invari ective focal DTAGRAMS	* 5.7 height: -1.0 dist.: -1.0 ngth: 0 ication: 1 radius: 1 ant: -1.0 length: 0	7296e-05 0000e+14 0000e+20 0.0 000000 000000 000000 0000e-06 0.0	Objec Chief Srf Tota Srf Snf Petz	t height: ray ims l Print Wind Print Page Print Selec Copy Wind Copy Page Copy Sele	neight: ow tion low stion	-1.0000e+14 0.0 00e+20
Fie Gau Obj Gau Ove Par OTHER Ent Lag Eff SPOT I Aper X 1,	ld angle: ssian image GATES ect distance ssian image rall lens le axial magnif DATA rance pupil rance pupil range invari ective focal DIAGRAMS rture divisi /e^2 entr. i IAL TRACE	* 5.7 height: -1.0 dist.: -1.0 ngth: 0 ication: 1 radius: 1 ant: -1.0 length: 0 ons: 17 rrad.: 1	2960-05 2960-05 20000e+14 0000e+20 0.0 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.000000	Objec Chief Srf Tota Srf Snf Petz Gaus Y 1/	t height: ray ims l Print Wind Print Selec Print Selec Copy Vinc Copy Selec Save Winc Save Page Save Selec	neight: pw tion low stion dow As s As s As	-1.0000e+14 0.0 00e+20
Fie Gau: CONJUG Obj: Gau: Ove Par- OTHER Ent: Lag Eff: SPOT Apel X 1, SRF 0	Id angle: ssian image GATES ect distance ssian image rall lens le axial magnif DATA rance pupil cance pupil cance pupil daGRAMS rture divisi /e^2 entr. i IAL TRACE 0.0	* 5.7 height: -1.0 dist.: -1.0 ngth: 0 ication: 1 ant: -1.0 length: 0 ons: 17 rrad.: 1	22960-05 22960-05 20000e+14 20000e+20 20000e+20 2.0000000 2.0000000 2.0000000 2.0000000 2.0000000 2.0000000 PI 1.00000e-20	Objec Chief Srf Tota Srf Srf Betz Gaus Y 1/	t height: ray ims I Print Wind Print Page Print Select Copy Wind Copy Select Save Wind Save Page Save Select Backgrour Text Color	neight: ow tion low stion stion stion As stion As d Color	-1.0000e+14 0.0 00e+20 00e+40 000000 cc be-06

# **Spreadsheets (SS)**



- stack on top of each other (FILO)
- Revert feature for lens data

Confidential & Proprietary – Lambda Research Corporation

## **Command Line**



- Max length is 256 characters
- Drop down list is history buffer -
  - Click drop down arrow:
  - Press F4 on keyboard
  - Press Ctrl + PageUp
  - Press Ctrl + PageDown
- Command: ✓ Command: ✓ Arg\_entry = Popup\_menu;setup\_txttbar; Arg\_entry = Popup\_menu;setup\_gfxtbar();
- Windows Cut/Copy/Paste support by right click only
- Keystrokes forwarded from Graphics & Text Windows
- Need to click on command to edit
- Press Enter, Escape or click button:

Enter	
Escape	
Help	





# **Command Line Syntax**

- C-compatible or free form
  - draw\_rays(0,5,-1,1,0,0)
  - draw\_rays 0 5 -1 1
- Long or Short Form
  - drr and draw\_rays are the same command (aliased)

Command:

draw\_rays(0,5,-1,1,0,0)

- Forced Prompt Operator (?)
  - ? Causes prompts for all missing arguments
- Calculator Mode
  - 2 + 2 ENTER produces "Result = 4" message
  - SmartCells distinguish between commands and values
  - Named registers OSLO Lens data (RD, TH, ..etc.)
  - Symbolic input: a=PI; 2\*PI





## **Databases**



Anomorphic Brovals objective 2x BAY TRACE ANALYSIS

- Configured for CDB files
  - Supports CSV and related files
- **New Features** •
  - Fixed width, horizontal scrolling
  - User programmable with callback buttons
  - Limited keyboard support
  - List support



## **Slider Wheel Window**

- Special Window for 32 Sliders
  - Combined with data entry spreadsheet
  - Supports mouse wheel
  - Variable range for real data
  - User programmable
  - Integer, Real, Real Fixed, and List data types

Integer





## **Catalog Lens Window**

- Graphical Database for Stock Lenses
  - Scrollable lens list
  - Automatic drawing of lenses
  - Database sorting for focal length, diameter & part number
  - Range selection
  - User configurable





## Printing

- Uses Standard Windows Drivers
  - Standard printer selection dialog box
  - Standard page selection dialog box
- HPGL Graphics Output

Print	? 🗙
Printer	
Name: HP LaserJet 4000 TN PCL 6	Properties
Status: Ready	
Type: HP LaserJet 4000 Series PCL 6	
Where: hp4000	
Comment:	Print to file
Print range	Copies
<ul> <li>All</li> </ul>	Number of copies: 1
C Pages from: to:	
O Selection	1 1 2 3 Collate
Help	OK Cancel

- Other Protocols Supported Through Windows
  - \*.wmf, \*.emf files
  - \*.bmp files for OpenGL output
  - Limited postscript support through Windows
- Lambda Research does not provide device support



## Introduction

- Installation
- User Interface
  - Windows Topics
    - Menus
    - Toolbars
    - Main Window Types
      - Graphics
      - Text
      - Spreadsheet
    - Other Windows
      - Command Line
      - Database
      - Editors
      - Slider Wheel
      - Catalog Lens
      - Printing

- Setup
  - Preferences
  - Fonts
  - Mouse
  - Keyboard
- File and Program Information



## Introduction

- Installation
- User Interface
  - Windows Topics
    - Menus
    - Toolbars
    - Main Window Types
      - Graphics
      - Text
      - Spreadsheet
    - Other Windows
      - Command Line
      - Database
      - Editors
      - Slider Wheel
      - Catalog Lens
      - Printing

- Setup
  - Preferences
    - Fonts
    - Mouse
    - Keyboard
- File and Program Information



#### Preferences

- Determines Program Parameters
- To Show Preferences:
  - See File>>Preferences>>Show
     Preferences
  - Type shp on the Command Line
- To Set Preferences:
  - See File>>Preferences>>Set Preferences
  - Type stp on the Command Line
- Values include int\_pref, real\_pref, ...etc.
- Saved in .../private/oslo.ini
- Look up "Preferences" in on-line help for complete list

New Lens       CltI+N         Open Lens       CltI+N         Open Lens       CltI+S         Save Lens As       Lens Database         Impot Lens File       Ints         Export Lens to CAD       Open Database         Open Database       Ints         Vaniables       Of 1         Open Database       Ole 20.000000 Primary         Page Setup (Text)       APERTURE RADIUS GL         Save Text       6.500000 K         Print Graphics Winds       S.000000 P         Page Setup (Graphics)       S.000000 A         Save Graphics As       Preference Groups +	File	Lens	Evaluate	0 0 Dptimize	Tolerar	motrip ice S	ource	Tools	Windo	um Edi w Hel	tion P	
Lefs Database Import Lens to CAD Upen Database Description Ints Variables Draw Dr Ints Variables Dr Ints V	N O S	lew Len )pen Lei jave Ler jave Ler	is ns ns As			Ctrl+N Ctrl+O Ctrl+S						
APERTURE RADIUS         APERTURE RADIUS         GI           Page Setup (Text)         3.6337e+19         5           Sever Fex         6.500000         K           Page Setup (Graphics)         5.000000         K           Save Graphics As         5.000000         A           Preferences         Preference Groups         1	In E O	iens Dat mport Le Ixport Le Ipen Da	abase ens File ens to CAD. itabase				• 1	nts Zoom le	Variab 20.0	1 100000	Draw C of 1 Primar	in 'Y '
Print Graphics Window         6.500000         P           Page Setup (Graphics)         5.00000         S           Save Graphics As         5.00000         A           Preferences         Preference Groups         3	P 5	age Cel lave Te	t Window tup (Text)					APEF 3.63	RTURE R 397e+19 .500000	ADIUS	]	A SK
Preferences Preference Groups	P P S	Print Grap Page Sel Save Gra	phics Windo tup (Graphic aphics As	;s)				6 5 5	.500000 .000000 .000000	) P ) A		A
1 demo\LT\demotrip.len 2 lib\BETENSKY\3-5 telecentric.len 3 lib\BETENSKY\1-2 compensator.len 4 TRIP.LEN	P 1 2 3 4	reference demo\l lib\BET lib\BET TRIP.L	ces LT\demotrip TENSKY\3- TENSKY\1-; EN	ilen 5 telecentri 2 compens	ic.len ator.len			Prefere Set Pro Show Restor	ence Grou eference Preferenc re Default	ips  e Prefere	nces	SK A



## **Fonts**

Need fixed and variable spaced Choose ( fonts Font

1 1 Mor 1 WP

- Fixed Fonts
  - Spreadsheets, text output
  - Maintains columns
- Variable Fonts
  - Messages, prompts
  - More readable
- Change using OSLO menu item ٠ Windows>>Choose Fonts
  - Note: 2 dialogs open sequentially. Tr
    - Variable: MS Sans Serif 8pt or
    - Fixed: Lucinda Console 8pt
  - Don't use > 10pt (formatting problem

		Premium Edition
4		Window Help
u		Text 🕨
hoose fixed-width font for te	xt areas:	? ≍ Graphics ►
Font: Lucida Console Courier New Fixedsys T ISOCTEUR Lucida Console T Wonospac821 BT T WP BoxDrawing	Font style: Size: Regular 8 OK Regular 8 Cance Bold Bold Italic 11 12 14 Sample	el Chliose Fonts Arange Icons Status Bar Tile Windows
	AaBbyyzz	s: ? X
n	MS Sans Serif MS Sans Serif MS Serif Tr OzHandicraft BT Ø Palatino Linotype Tr Proxy 1 MS Sans Serif Database Politikstyle. Regular Bold Bold Bold Italic	8 OK 8 Cancel 10 12 14 18 24 Help
Try,	Tr Proxy 2	
or	Sample	AaBbYyZz
ems)	Script:  Western	×



#### Mouse

- Left click selects
- Right click pops up context menu
- Double click updates graphics
- Drag
  - Zooms graphics (Marquee box)
  - Selects range in spreadsheet, text output
- Shift-click changes input mode in spreadsheet
- Wheel zooms graphics, scrolls SS and sliders
- Slow mouse wheel preference(slmw)
  - 1 event/notch when on, 3 (typical) when off



## Keyboard

- Text keystrokes sent to Command Line:
- CTRL + Arrows: zoom graphics
- SHIFT + Arrows: select text output
- CTRL + PageUp/PageDown: scrolls history up/down
- TAB & SHIFT TAB navigates dialogs and spreadsheets
- Keyboard arrows navigate SS but don't cross fixed boundary
- Windows intercepts some keystrokes (e.g. F4)
- Define special keystrokes as "accelerators"
  - See "Other Accelerators" menu in a\_menu.ccl



## **Status Bar**

- Visibility set by preference shsb
- Choose Menu item: Window>> Configure Status Bar to set items
- Items are pre-programmed for CCL
  - Select pre-programmed items from the list
  - Use Set\_Preference (stp) command to set value
    - Strcpy(Astr, "My item"
    - stp(sb04, Astr)
    - "My item appears in field 4 of status bar.



## Introduction

- Installation
- User Interface
- File and Program Information
  - OSLO File System
    - OLSO File Hierarchy
    - LEN/OSL Files
    - CCL/CCX Files
    - CC Source Code Files
    - SCP Files
    - CDB Files
    - Other OSLO Files
    - Import/Export Files
  - OSLO Functional Flow



#### **OSLO File Hierarchy**





#### **Public Folders**





#### **Private Folders**



## **OSLO File System**

- Public and Private Directories
  - Public Files marked "read-only"
  - Private set by OSDATA environment variable in win.ini
  - Also uses "current" LENS and TEXT directories
- Special File Types
  - LEN or OSL (set under *preferences*)
  - SCP
  - CCL
  - CDB
- Uses Modified Windows Dialog Box:

Open Lens File		? ×
Look in: 🦳 BETENSKY	▼ ← €	) 💣 🎟 -
🚞 Premium	🛞 1-6 improved.len	🛞 3-1 real finde
🛞 1-1 single element.len	🔞 2-1 np singlets.len	🛞 3-2 mod-1 rea
1-2 compensator.len	🔞 2-5 patent.len	🛞 3-4 mod real
🚳 1-3 primaryabs.len	🕘 2-6 np-mod1.len	🛞 3-5 telecentri
1-4 primary min.len	🕘 2-8 ogino 35-70.len	🛞 4-1 n singlet.l
🕲 1-5 fix brillen	🚳 2-9 ito 28-70.len	🛞 4-2 pn singlel
•		F
File name:		Open
Files of type: Lens files (*.le	n;*.osl)	Cancel
		Help
(	Library Directories: Private	Public



# **LEN/OSL** Files

- LEN is current format
- Text files containing optical prescriptions by listing commands
  - //OSLO header line
  - LEN NEW ...more lines... END
  - CFG NEW ...more lines... END
  - Miscellaneous data lines
  - VAR NEW ...more lines... END
  - RST NEW …more lines… END
  - OPE NEW ...more lines... END
- Use literal or symbolic data
- Insert one lens into another

- (lens surface data)
- (multi-configuration data)
- (operating conditions)
- (optimization variable data)
- (rayset data)
- (optimization operand data)



# CCL/CCX Files (1)

- CCL: Compiled Command Language Similar to Java
- File Name not significant
  - Scanccl.ccl used from the command line locates commands
  - File prefix groups commands
- All CCL Files Compiled to \*.AMO
  - AMO: AppMan Object file
- Automatically Compiled with OSLO Editor
- Incremental Compile/Link
- "Private Files" Outrank "Public Files" in Usage Order
- Use \*.CCX for In-Process Files



## CCL/CCX Files (2)

- File Locations of Special CCL Commands
  - Argument definitions & globals: a\_global.ccl
  - Strings: a\_string.ccl
  - Lists: a\_list.ccl
  - Menus: a\_menu.ccl
  - Toolbars: .../inc/a\_toolbar.h



## **SCP** Files

- SCP: Star Command Procedure
  - Not as efficient nor as powerful as CCL
  - SCP is meant to be used to create simple scripts
  - SCP is a subset of CCL
- Search Order
  - Cmdname:filename
  - Current file, if specified
  - Default.scp

#### • File Format

# \* cmdname ccl command line statement; ccl command line statement; - etc. \*cmdname ccl command line statement; ccl command line statement; - etc. -



#### **CDB** Files

- Compatible with Excel, ...etc.
- Used for OSLO Lens Library, Source Database
- Edited with OSLO database spreadsheet
- Format is "Delimited Data" (\*.CSV, \*.TAB) with a Readable Header:

,=lbc...cdb6%4d%9.3f%9.1f%9.3f%-6.6ts%9.1f%12.6f BK7=1.5168,SILICA=1.45846 \tlex\_6,,,,,,,,,

LensID,Radius1,Thickness,Radius2,Glass,Diameter,Focal Length

1,25.95,4,0,BK7,20,0.0

2,-184,2,184,SILICA,30,0.0

3,21.577,6.9,-21.577,BK7,20,0.0

...more lines...



#### **Other OSLO Files**

# • \*.GLC: Glass Data

- \*. LMO: Lens Module (catalog lens)
- \*. TGL: Test Glass
- \*. OMD: Coating Material Data
- \*. OCD: Coating Prescription Data
- \*. MOV: Movie
- \*. INT: Interferogram
- \*. AMO: Appman Object Code



## **Import/Export Files**

- Import Data From
  - Code V (\*.SEQ)
  - GENII (\*.LNS, \*. LEN)
  - Sigma (\*. DAT, \*. LNS, \*. LEN)
  - Zemax (\*. ZMX)
- Export to CAD
  - IGES (\*.IGS)
  - DXF (\*.DXF 3D only) Tested with AutoCad & Design Cad
  - IGES support for Mastercam (COM Opticam format)
  - STEP conics only



#### **OSLO Functional Flow**

- OSLO is built on CCL
- OSLOxxxx.exe (all versions of OSLO):
  - Include library routines (from C)
  - Loads compiled CCL routines (from AMO files) for execution





## **Lens Drawing**

Drawing Conditions

- Location of drawings, space for ray trajectories
- Appearance (rings, spokes, apertures, mirror hatching)
- Rays to show (object points, fans, etc)
- Rays are not same as field point set or ray set
- Drawing Types
  - Plan View (Strictly 2D, not a projection)
  - Wire Frame (3D, uses color for surfaces)
  - Hidden Line (also incorrectly called solid model)
  - Shaded (Uses OpenGL)
- Zoom Drawing
  - Shows all positions



## **Element Drawing**

- ISO 10110 Compatible
  - Tabular format
  - Default SS shows ISO standard values
- Enter Data, Drawing automatically produced
  - Tolerances
  - Fabrication data
- Singlets Only
- Portrait Format Preferred



## **Evaluation Setup**

- Set Current Object Point
  - Automatically traces reference ray
  - Use caution in interpreting, not always used
- Set Current Wavelength
  - Used for analysis as default, indicated if not 1
- Set Current Configuration
  - Sets configuration for analysis
- Autofocus
  - Adds shift to image surface
- General Conditions



## **General Conditions**

- Evaluation mode, Aberration mode
- Units, OPD in waves
- Ray aiming type, Ray aiming mode
- Wavefront reference sphere position
- Symmetry State, Aperture checking
- Solves in alternate configurations
- Zernike polynomial reference axis
- Global reference surface for ray data
- Evaluation z-axis
- Source astigmatic distance
- Temperature, Pressure
- Use equal image space ray increments
- Polarization Ray Trace, Calculate diffraction efficiency



## **Paraxial Analysis**

- Paraxial Constants
  - Pxc, Pxs commands
- Paraxial Ray Trace
  - Pxt (in either XZ or YZ plane)
- Zoom Setup
  - Data for all zoom positions



## Aberrations

- Aberration Coefficients
  - 3<sup>rd</sup>, 5<sup>th</sup>, 7<sup>th</sup> SA
  - Seidel Pupil aberrations
  - Buchdahl Fifth-Order
    - M1 M12
    - Intrinsic/Transferred contributions
  - 3<sup>rd</sup> order axial gradient contributions
  - Transverse, Angular, Unconverted, Wavefront (3<sup>rd</sup>)
- Zernike Coefficients
- Zoom Group Sensitivity
- Aldis Theorem Contributions



## **Reference Ray Definition**





## **Image Evaluation**

- Ray Analysis
- Spot Diagrams
- Wavefront Analysis
- Point Spread Function
- Modulation Transfer Function
- Through-Focus MTF
- Slider Wheel Interaction with any Analysis

## **Ray Analysis Examples**





# **Spot Diagram Example**





## **Wavefront Analysis Examples**





## **Point Spread Function Examples**





#### **Modulation Transfer Function Examples**



## **Zoom Lens Analyses**







#### **Other Analyses**





## **Slider Wheel Interaction with any Analysis**



Confidential & Proprietary – Lambda Research Corporation





#### **INTERACTIVE TRIPLET DEMONSTRATION**



Confidential & Proprietary – Lambda Research Corporation