

A Trip for ASAP in 6hr

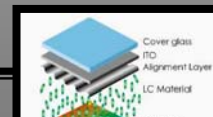
Advance System Analysis Program

ITRI/OES Q150, Taiwan

歐崇仁 (03)5918385

h880641@itri.org.tw

91/08/29



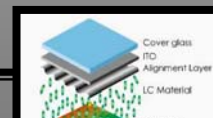
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Industrial Technology Research Institute
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歐崇仁 h880641@itri.org.tw
清華大學動力機械研究所
工研院光電所光機系統組
Multi-Physics數值計算與軟體

**Optical Mechanic Analysis/Design
Advance Study**

**Less than Proof, More than Theory
Same Equations leads to Same results**
跨領域的思考, 整合性的思考



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檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)

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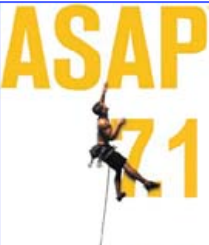
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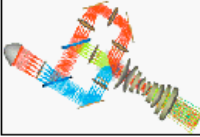
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熱門產品

- [財經分析及管理應用特輯](#)





8月29日在新竹中華大學舉行 ASAP研討會—由工研院光電所歐崇仁博士主講，研討主題包含ASAP使用入門介紹、ASAP應用範例說明、ASAP使用者介面與程式語言介紹，免費參加，機會難得，請即報名！！



ASAP可精確地建構和快速地分析複雜的3-D模型，是光電產業界工程師最得力的輔助工具。



Citrix MetaFrame 軟體可透過企業入口網站，讓使用者在任何地點，使用任何作業平台，執行任何應用程式，降低企業執行成本。



最佳控制發展系統，dSPACE的專長就是控制器快速建模(Rapid Control Prototyping)及硬體迴路的控制器測試(Hardware-in-the-Loop Simulation)。

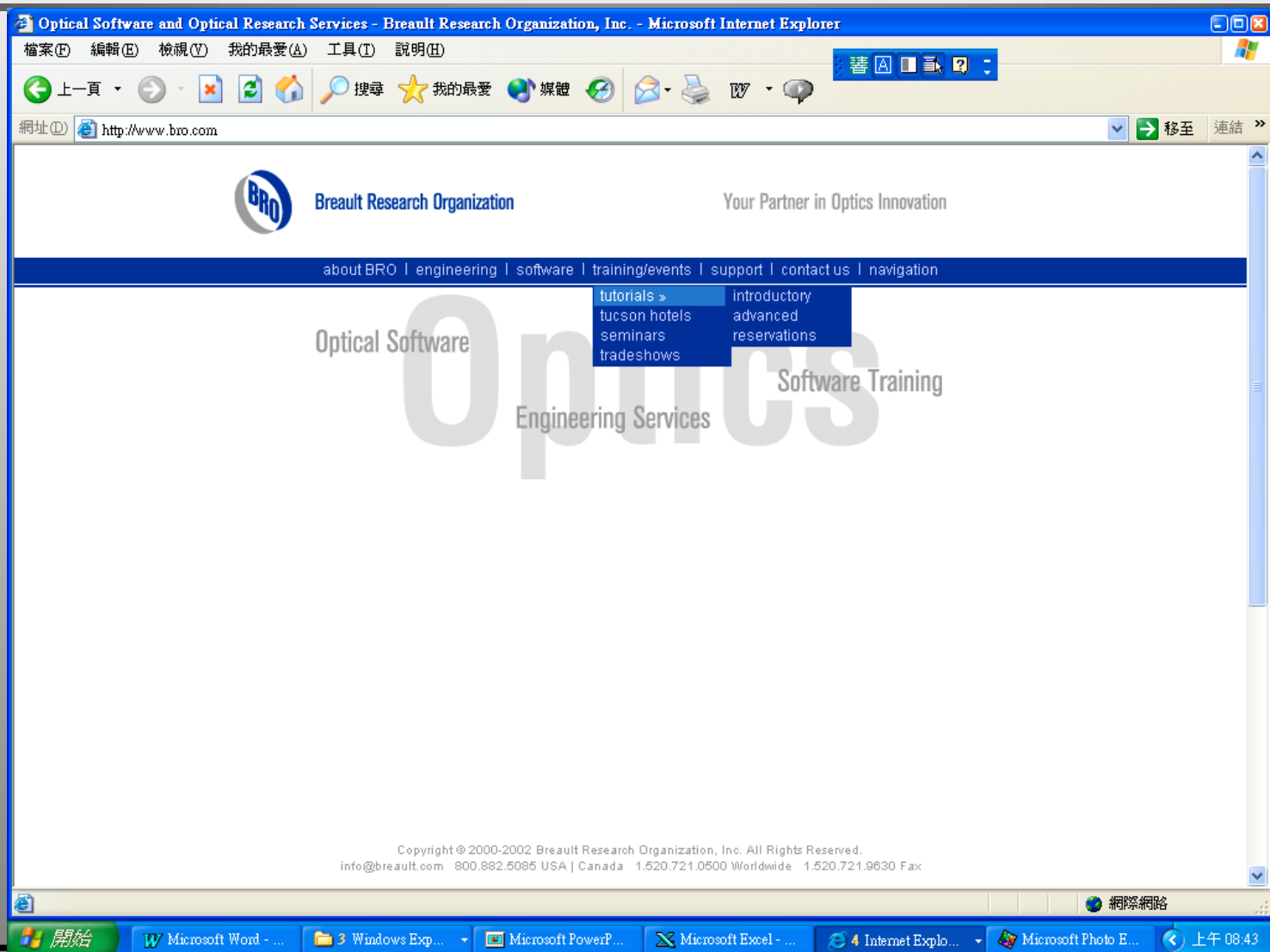


為目前全球市場佔有率最高的

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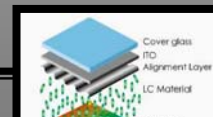
- 0820 [8月29日在新竹中華大學舉行ASAP研討會](#)
- 0814 [經濟計量分析軟體 LIMDEP V8.0 & NLOGIT V3.0新版上市!!](#)
- 0812 [技術專欄：Mathematica在微分方程上的應用](#)
- 0808 [以升級價格購買 Mathematica 4.2](#)
- 0808 [免費升級到Mathcad 2001i](#)
- 0806 [國際光電大展／8月15～18日／吳青攤位：D627／展出內容：ASAP光學軟體](#)
- 0805 [好書推薦：Mathematica程式設計風格與應用](#)
- 0805 [數值分析與統計計量](#)

http://www.bro.com



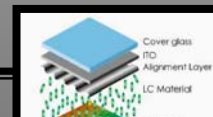
Outlines

- (1) What is ASAP/Basic GUI**
- (2) Philosophy of Using ASAP**
- (3) Command Script**
- (4) Some Advance Topics**



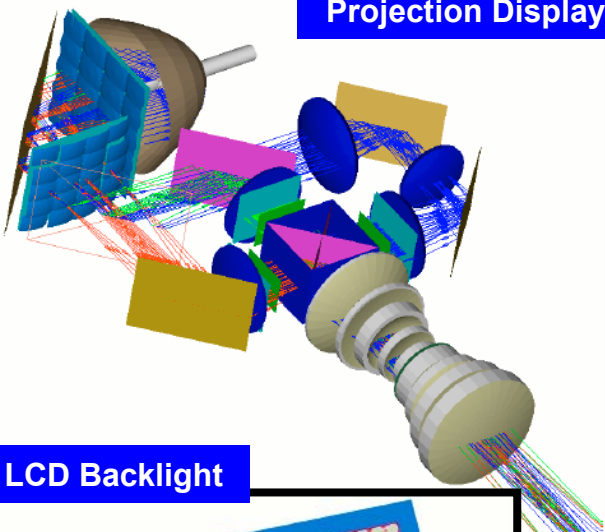
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Basic User Interface

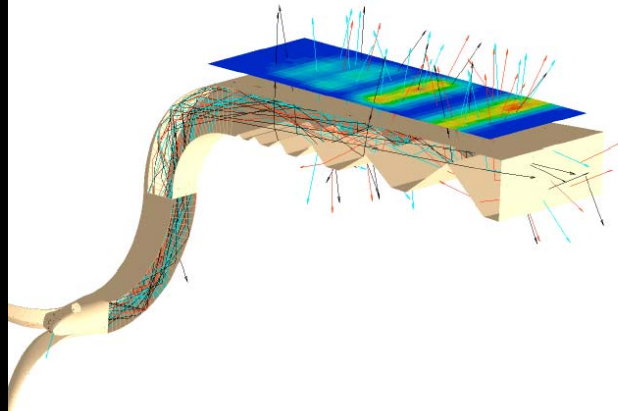


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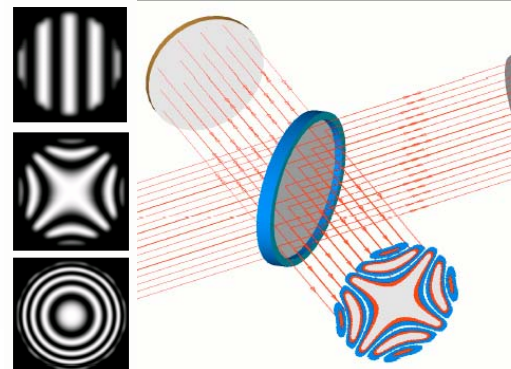
Projection Display



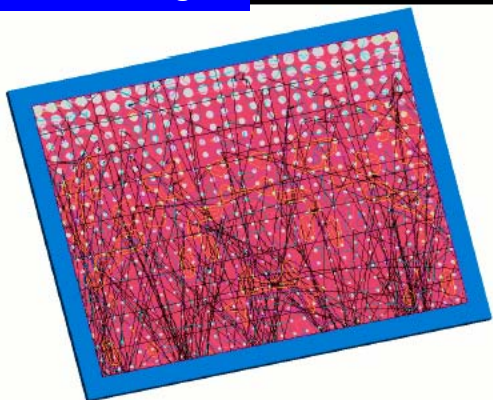
Lightpipe



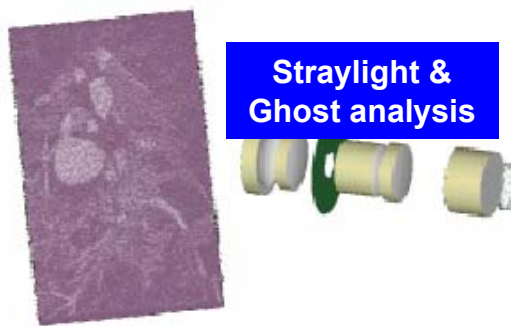
Physics Optics



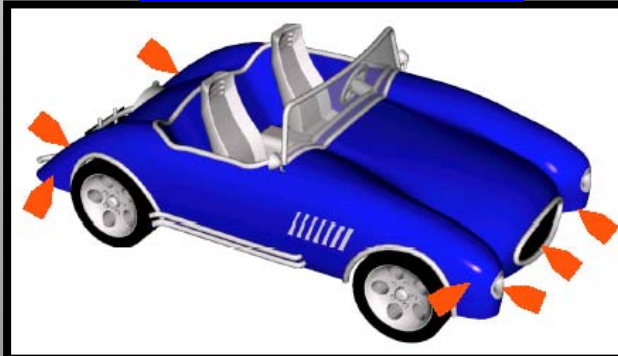
LCD Backlight



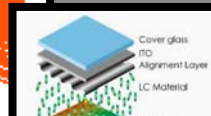
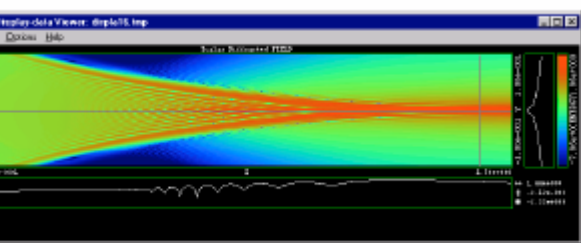
Straylight & Ghost analysis



Lighting Compliance

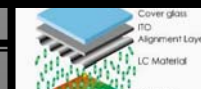
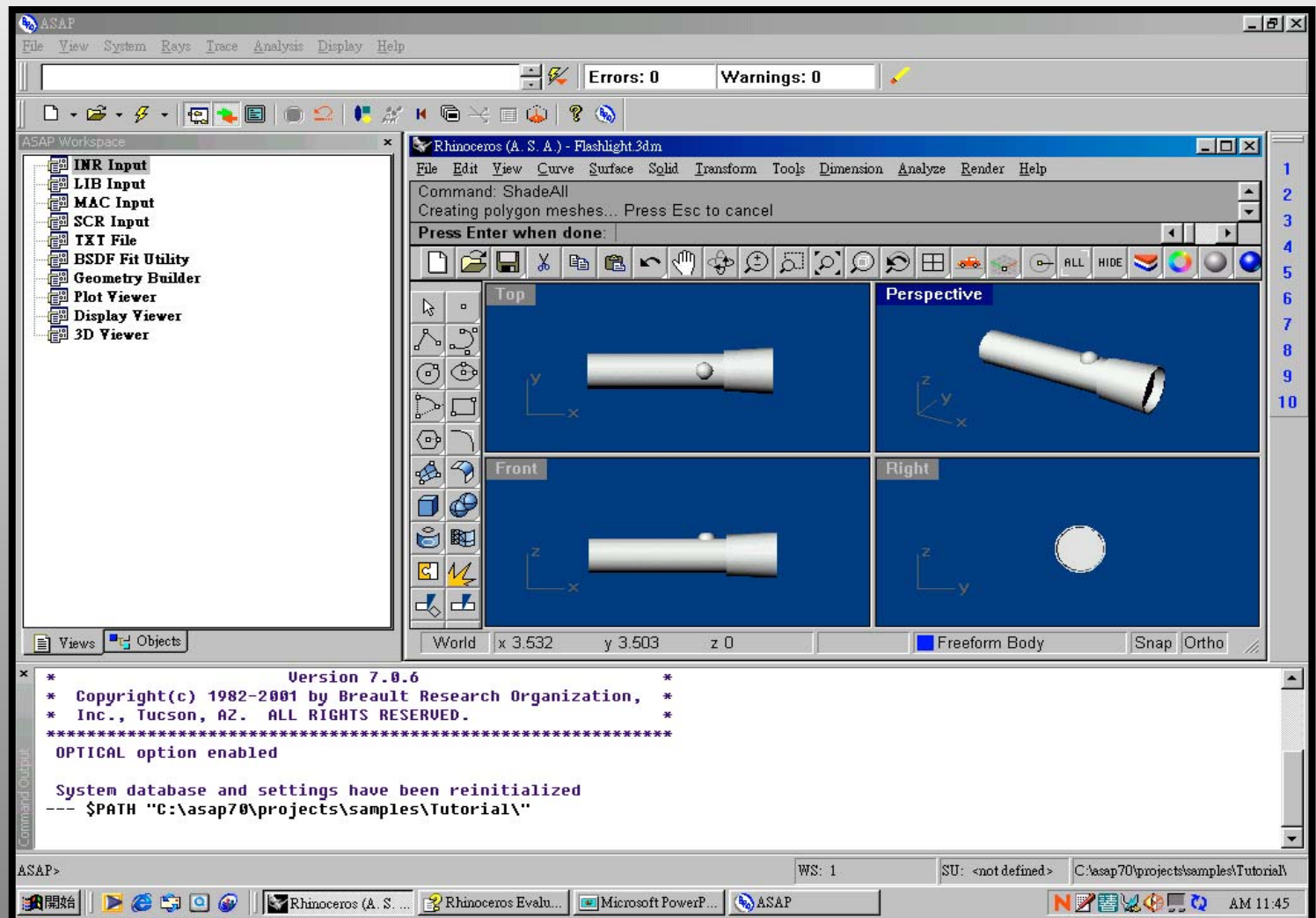


Fiber Coupling



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ASAP GUI



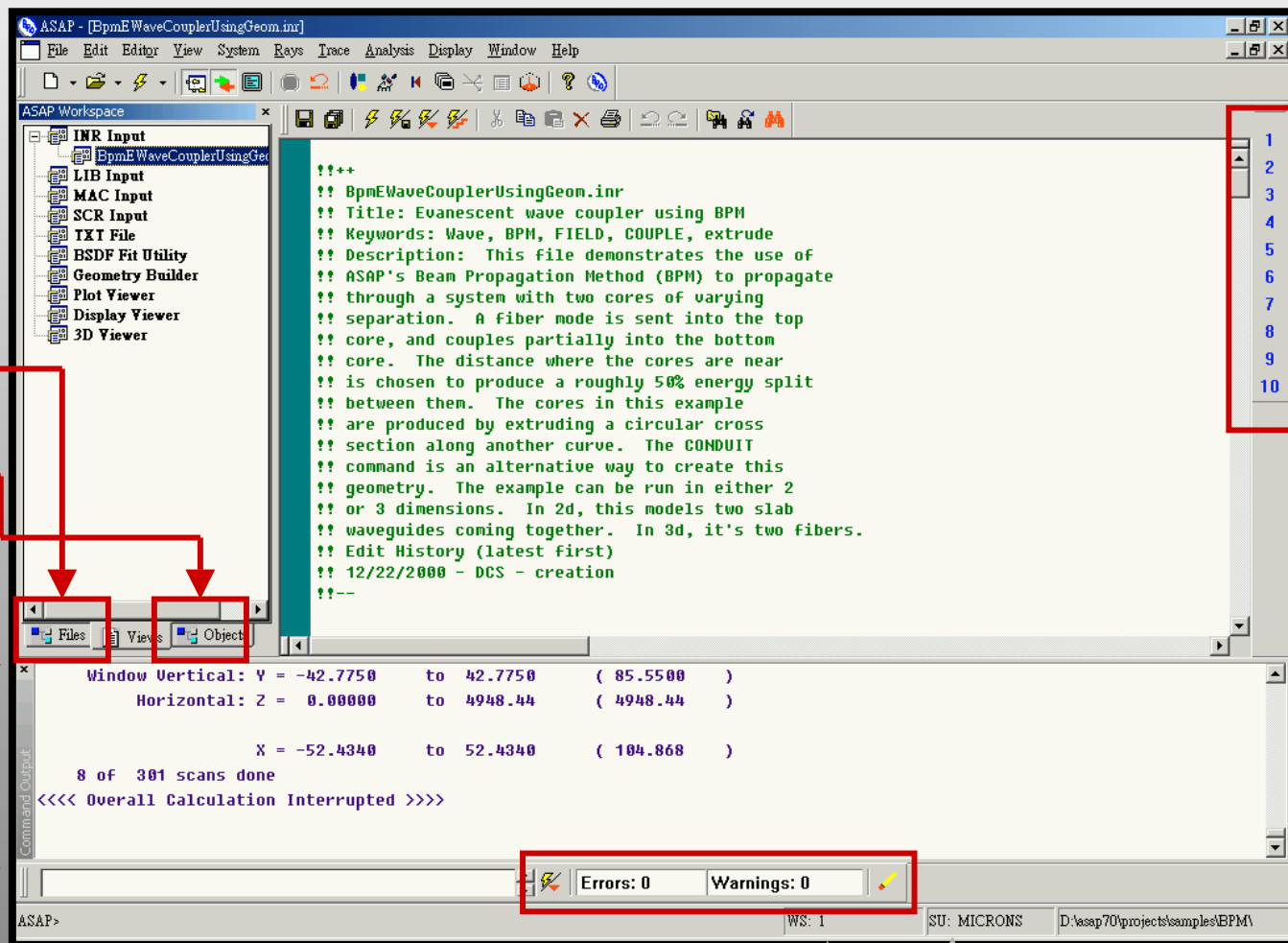
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ASAP GUI

Project Files

User definable bottom bar

Project - D:\asap70\projects\sam
ReadMe.txt
BpmWaveCouplerUsingGeom
BpmWaveCouplerUsingGeom
BpmUserCoupling.inr
BpmUserCoupling2.inr
BpmPropAlongFiber.inr
BpmRibbedWaveguide.inr
BpmYBranch.inr



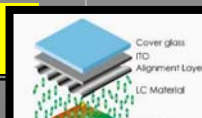
Object

ASAP Objects
TOP_FIBER
SIDES <#1>
CAP1 <#3>
CAP2 <#4>
BOTTOM_FIBER
SIDES <#2>
CAP2 <#5>
CAP2 <#6>

Command output window

Wavelength units

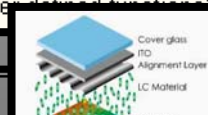
System units



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Main window toolbar

	Clicking the New button opens an editor window by default. If you click on the triangular arrow next to the button, you can select a project or other document type.
	Opens the Open Files dialog. The triangular arrow next to the button displays a list of previously opened files.
	Runs the current ASAP file. The triangular arrow displays a list of previously run files.
	Opens or closes the ASAP Workspace window.
	Opens or closes the Command Output window.
	Switches between your original screen setting and full screen.
	Stops current run.
	Immediately ends the current ASAP session and prepares for a new one by returning system settings to their default values.
	Opens the Builder.
	Plots a set of profiles (slices) of the system. This button is grayed out in the initial default setting.
	Rewinds the 3D graphics file (*.vcr).
	Displays the 3D graphics file (*.vcr).
	Traces rays. This button is grayed out in the initial default setting.
	Shows statistics of current ray data. This button is grayed out in the initial default setting.
	Shows an isometric plot of display data.
	Opens directions for searching ASAP online Help.
	Opens Contents in ASAP online Help.
	Opens information about ASAP.
	Performs user-defined function as defined in the Custom Commands tab on the User Interface Preferences dialog box (buttons 1 to 10 can be user-defined functions).



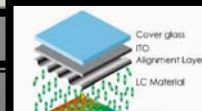
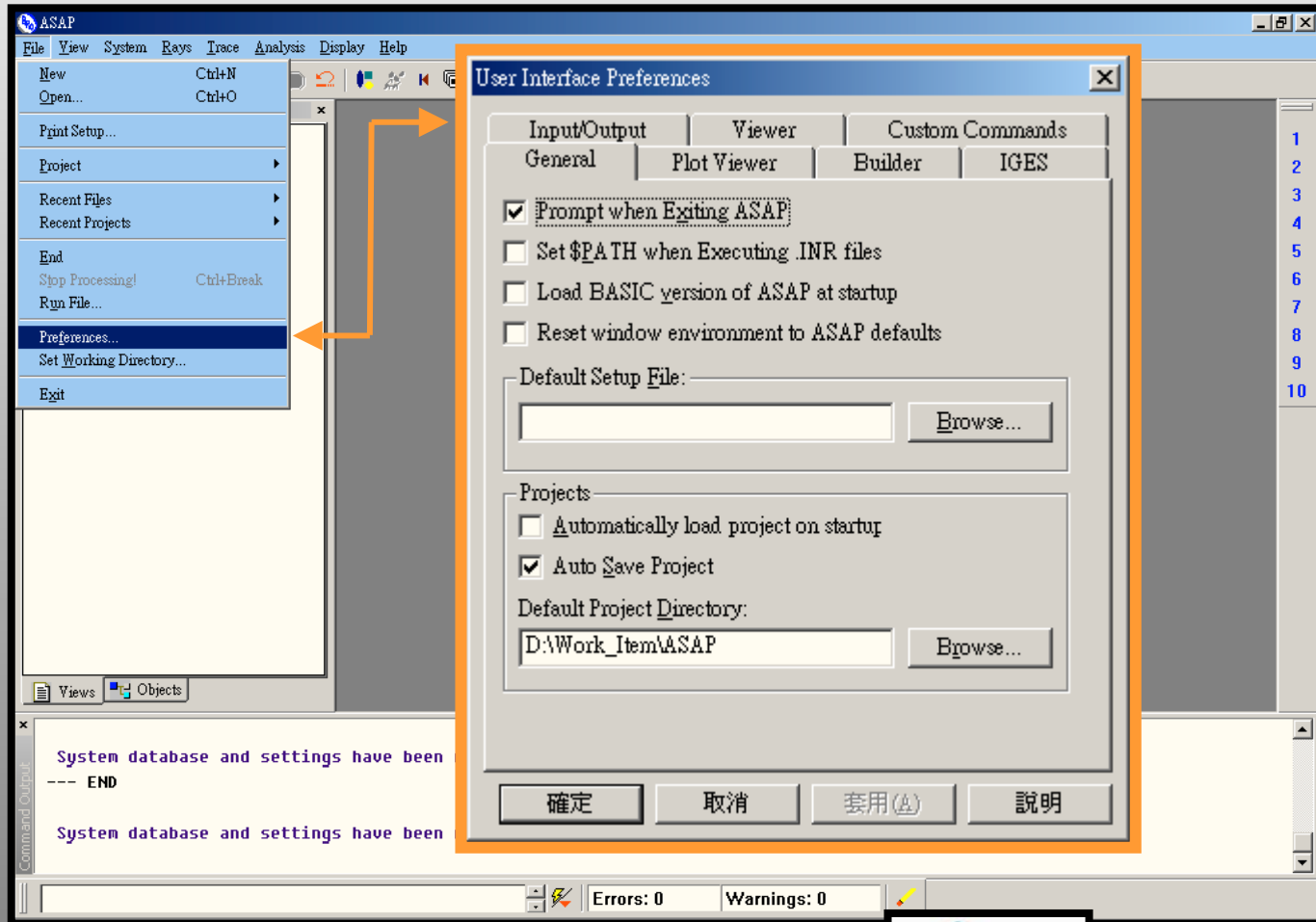
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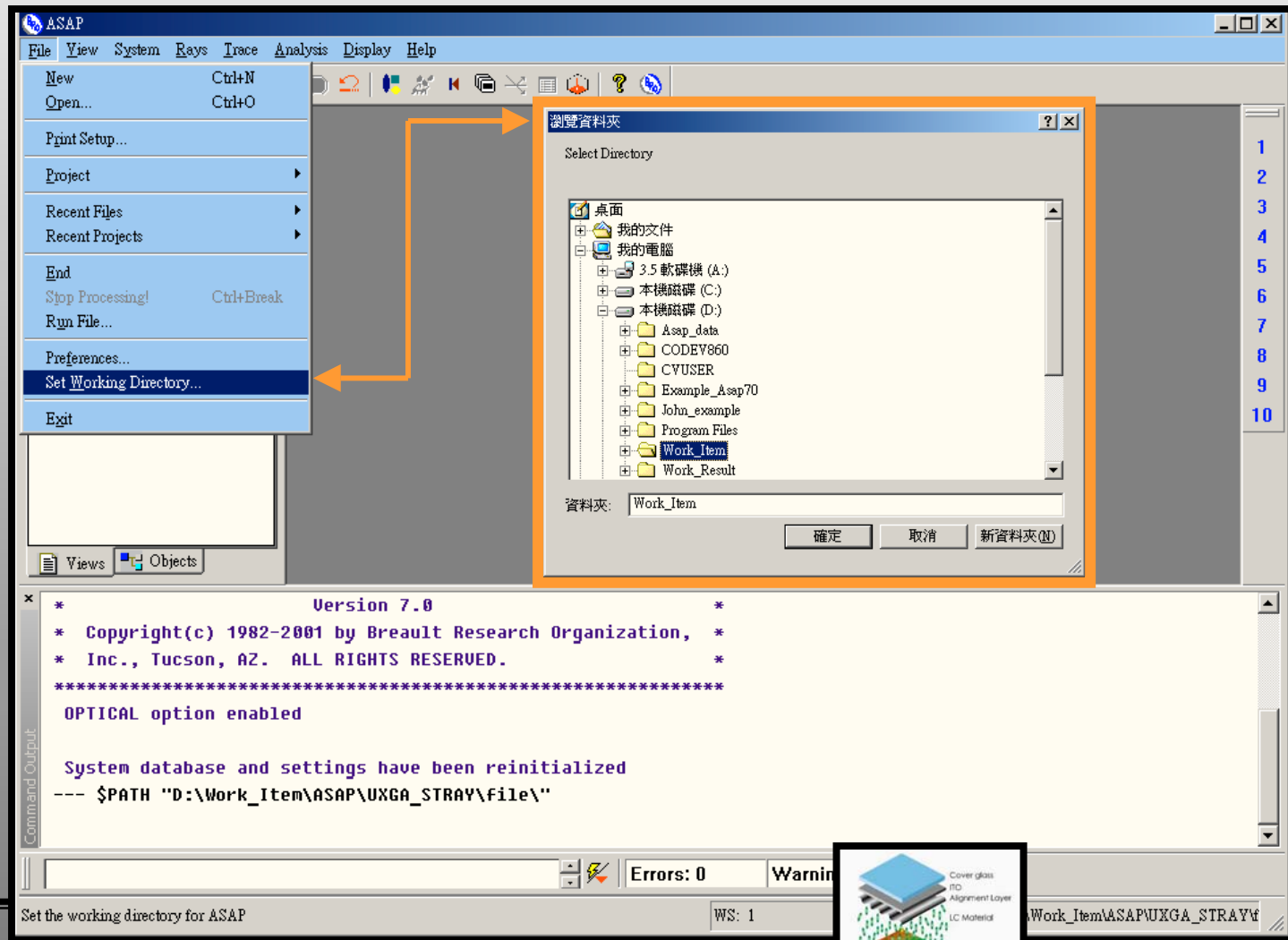
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User Interface Preferences



Set Working Directory



Build up system from the builder

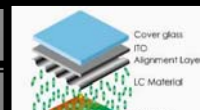
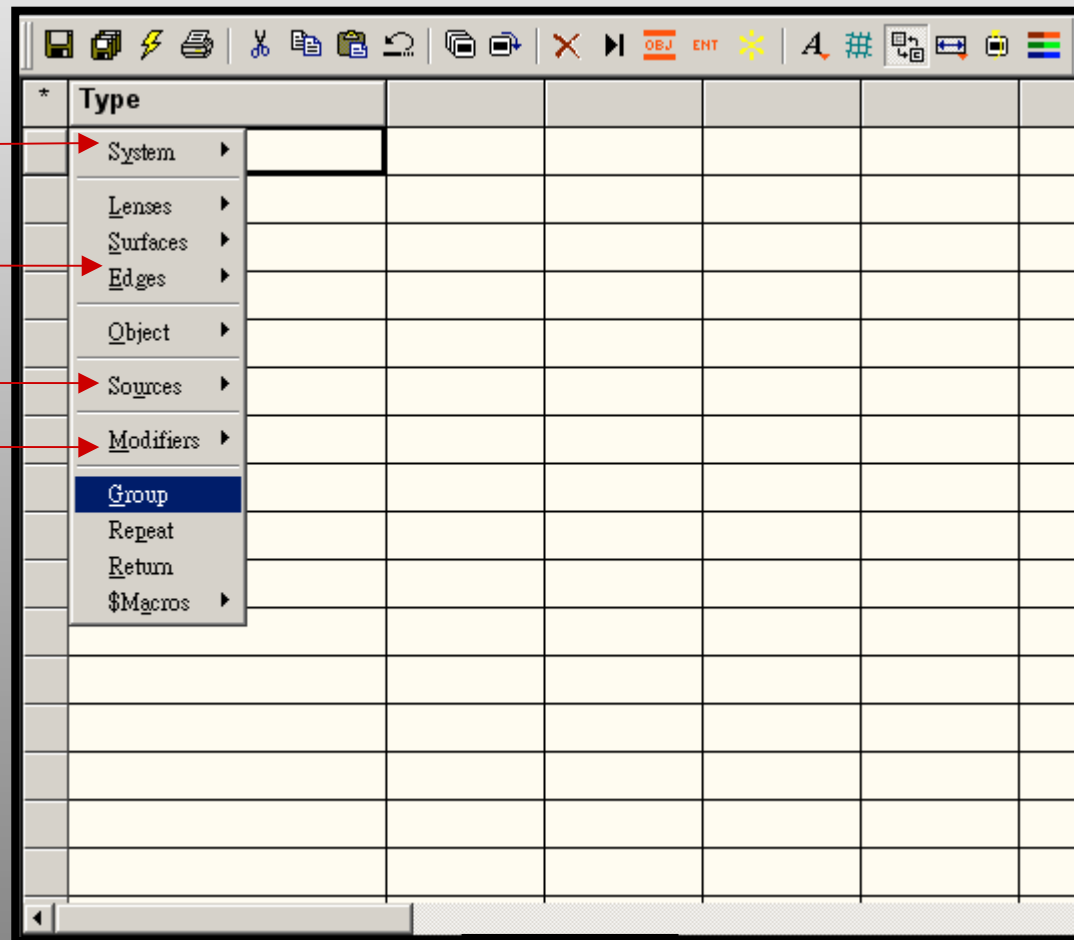
Procedure

1. Define the system parameters

2. Build up entities (object)

3. Build up source

4. Modify



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Information in ASAP

Define your system
in the builder

FILE
Run

The command sends
information from the
builder to ASAP kernel.
The kernel creates a
geometry database

ASAP Kernel

The ASAP kernel is the
computation engine that
performs ray tracing and
analysis

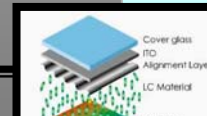
Ray Tracing

Plot Archive
(* .plr file)

Analysis

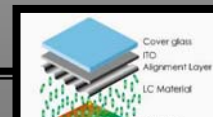
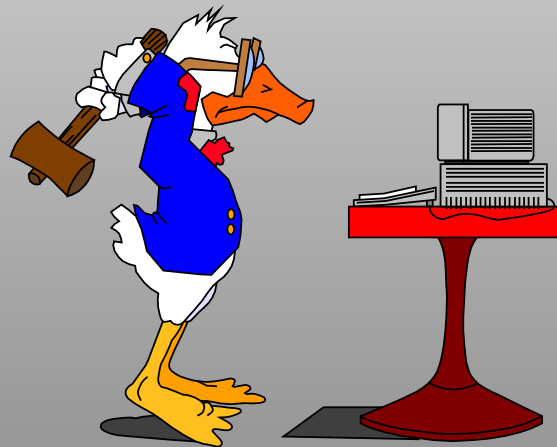
3D Vector File
(* .vcr File)

Display



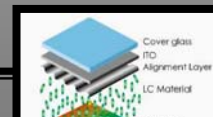
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**Now, please turn on your notebook/PC.
Let's make some fun with the ASAP 7.06 !!**



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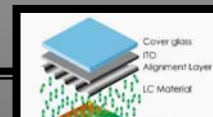
Philosophy of Using ASAP



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Numerical Methods

- Assumptions
 - Governing Equations (Fluid/Solid/Optics...)
 - Boundary Conditions
 - Discretizations
 - Solve
 - Post-Process
- System settings
 - Geometry
 - Source
 - Trace
 - Analysis



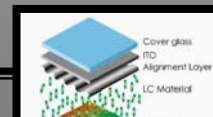
5 Steps & 3 Ideas



OBJECT !

1. Parameters setting
2. Build a Geometry
3. Create Source
4. Tracing rays
5. Perform analysis

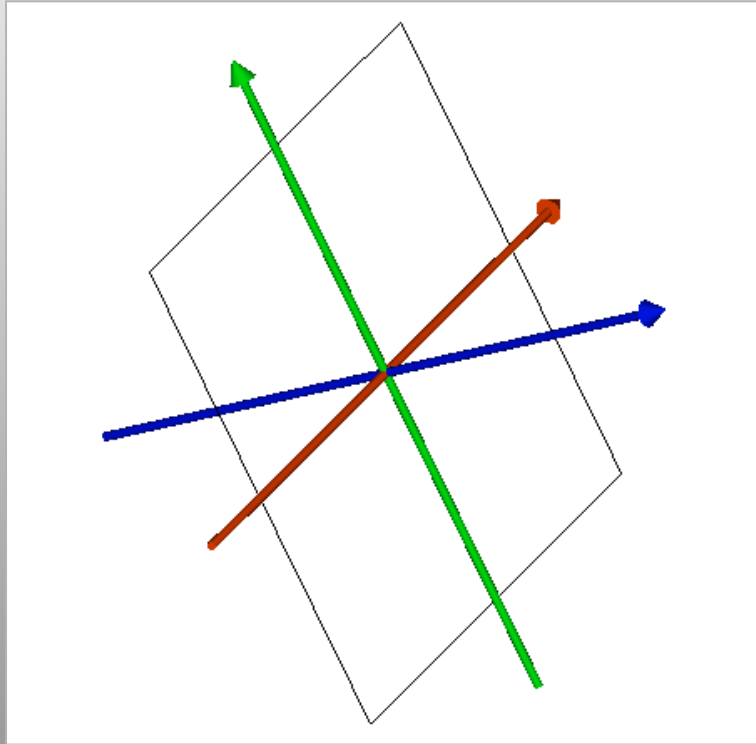
- Ray is not a Line !
- Ray only interactive with OBJECT,
- Ray is OBJECT, too!



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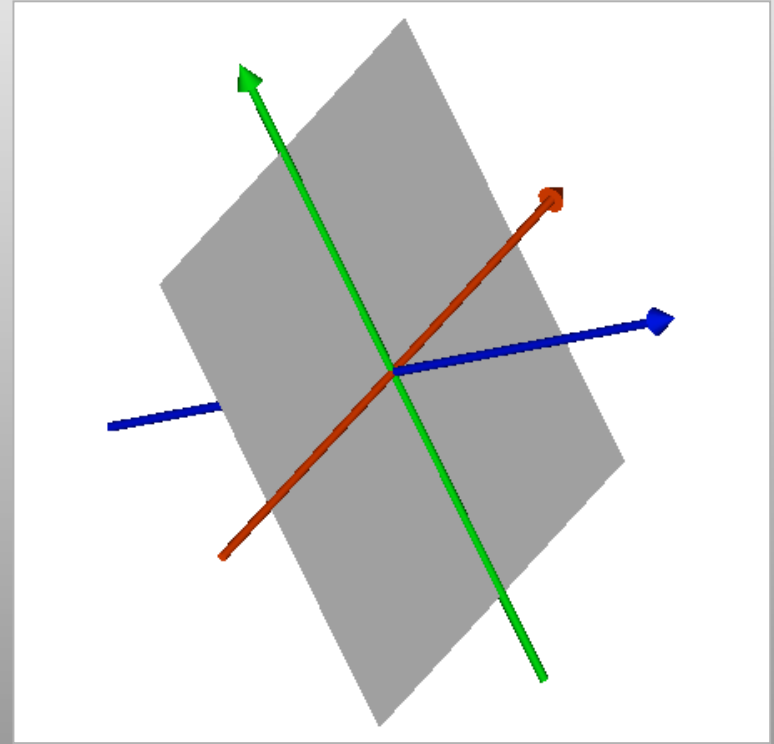
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Entity vs. Object



Entity

An **Entity** is a geometrical construct that does not interact with rays.



Object

An **Object** is a geometrical surface with boundaries, a position, an orientation, and optical properties. Object interact with rays

Three entity types in ASAP

Lenses

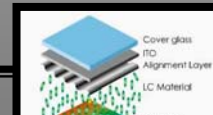
→ are sequences of circular conicoids.

Surface

→ are represented mathematically by a single equation $f(x,y,z)=0$ and are either infinite in extent or self-enclosed (that is, a plane or sphere, respectively).

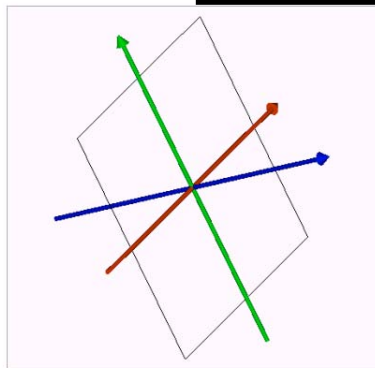
Curve/Edges

→ are made up of a series of points in space.



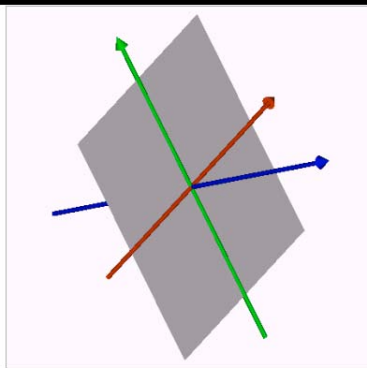
ASAP “OBJECTS”

- Surface : Mathematical; Fast
- Edge : CAD program; Slower
- Lens : Compatible with Lens Design program; sequential



Entity

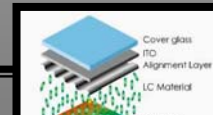
An **Entity** is a geometrical construct that does not interact with rays.



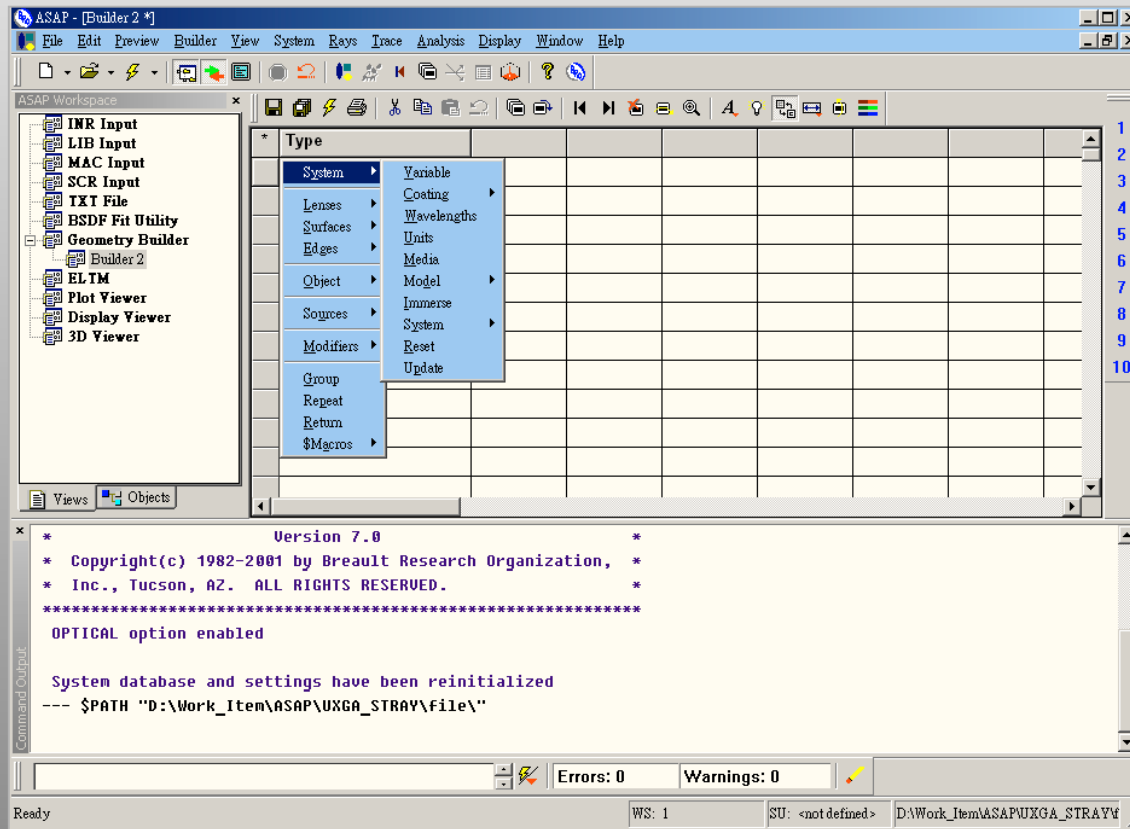
Object

An **Object** is a geometrical surface with boundaries, a position, an orientation, and optical properties.

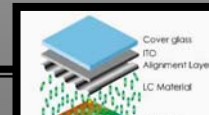
!!Object interact with rays



System Parameter ? How?



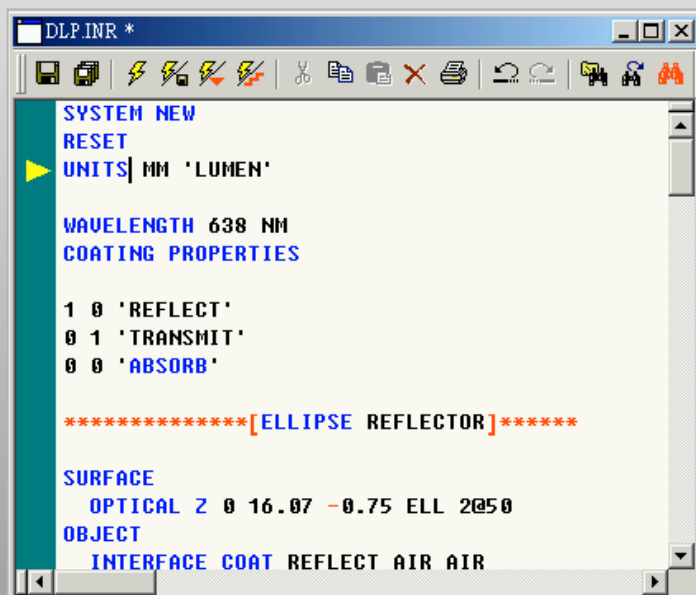
System
Reset
Units
Wavelength
Coating Properties
Media



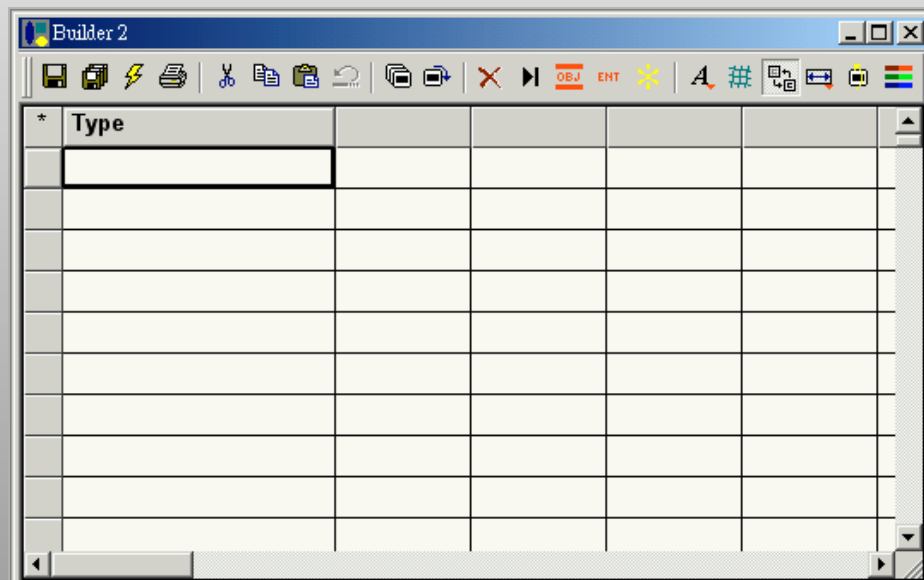
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Geometry? How?

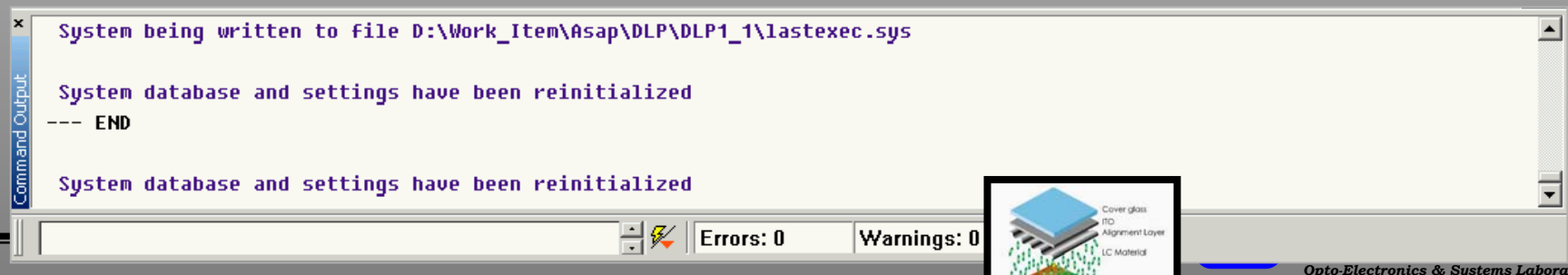
1.From the editor(*.inr)



2.From the Bulider(*.ent)



3.From the command console



Preview...



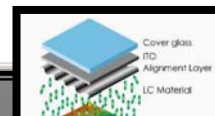
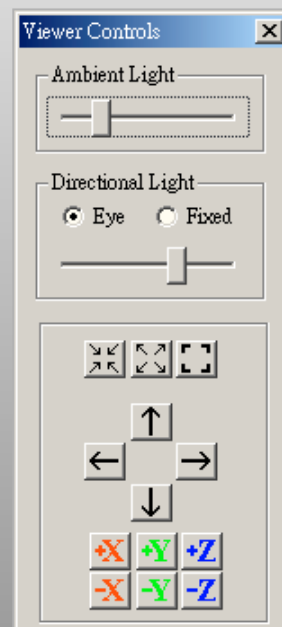
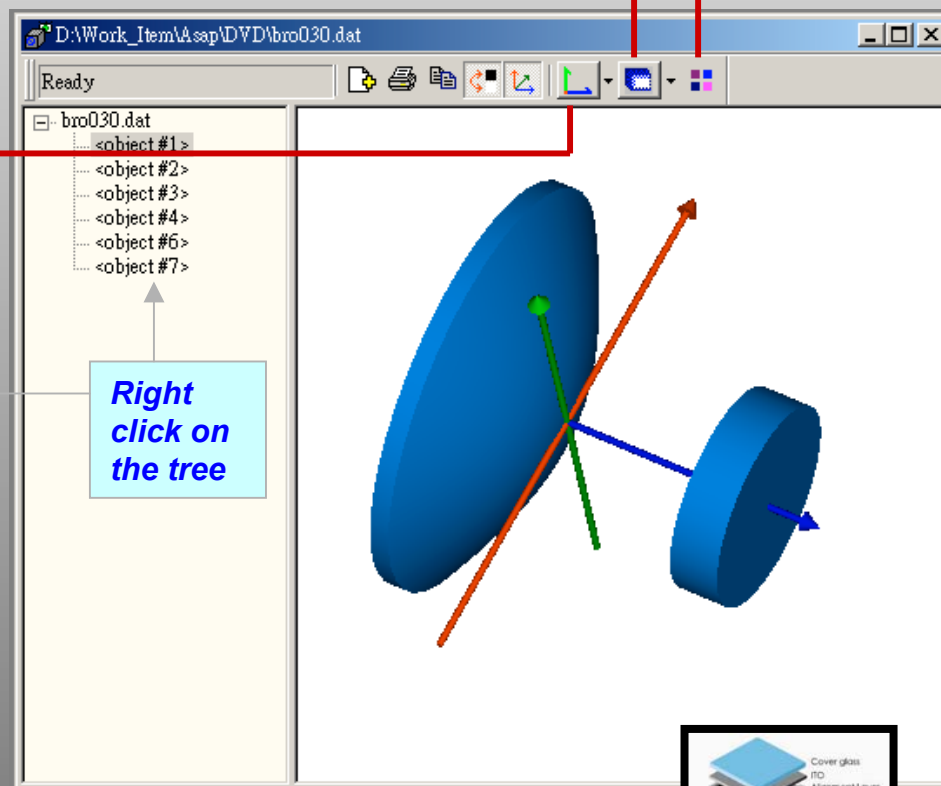
Standard/user defined view

- Standard View 1 (Y-Z)
- Standard View 2 (Y-X)
- Standard View 3 (X-Z)
- Standard View 4 (isometric)
- Standard View 5 (user-defined)
- Standard View 6 (user-defined)

Hot Keys

Properties...	Enter
Optional Properties...	Shift-Enter
Close File	Delete
Make Visible	V
Hide	H
Wireframe	W
Lit WireFrame	L
Flat Shaded	F
Smooth Shaded	S
Highlighted Edges	E
Zoom Extents	N
Isolate and Zoom Extents	I
Isolate w/o Zoom Extents	M

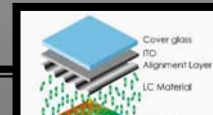
- Wire Frame
- Lit Wire Frame
- Flat Shaded
- Smooth Shaded
- Highlighted Edges



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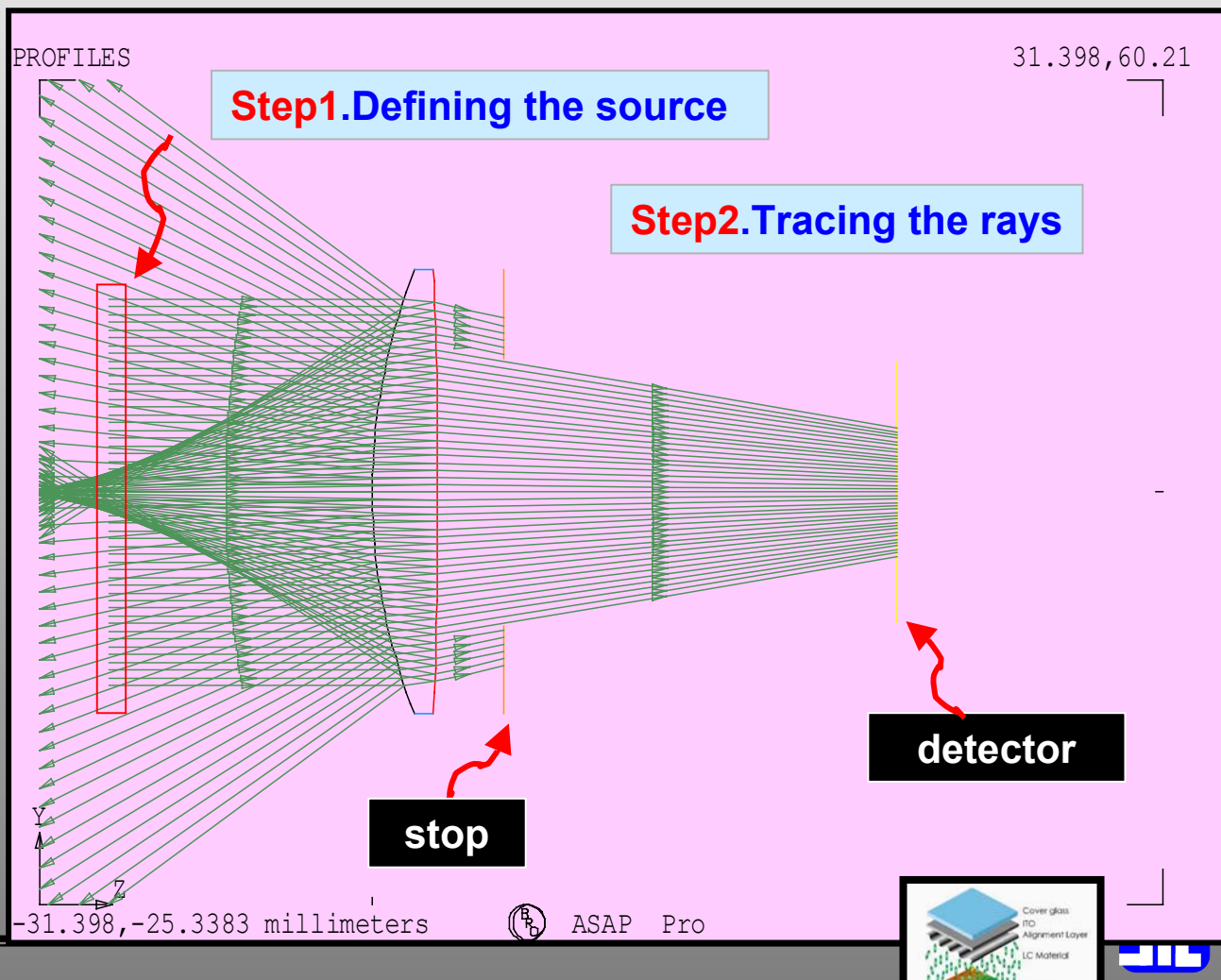
Source? How?

1. Create **GRID** sources within ASAP to simulate collimate、parallel and point source.
2. Create **EMITTER** sources within ASAP to simulate extend source.
3. Use lamps from the BRO source library.



Trace?How? A

Defining sources and tracing rays are two separate steps in ASAP

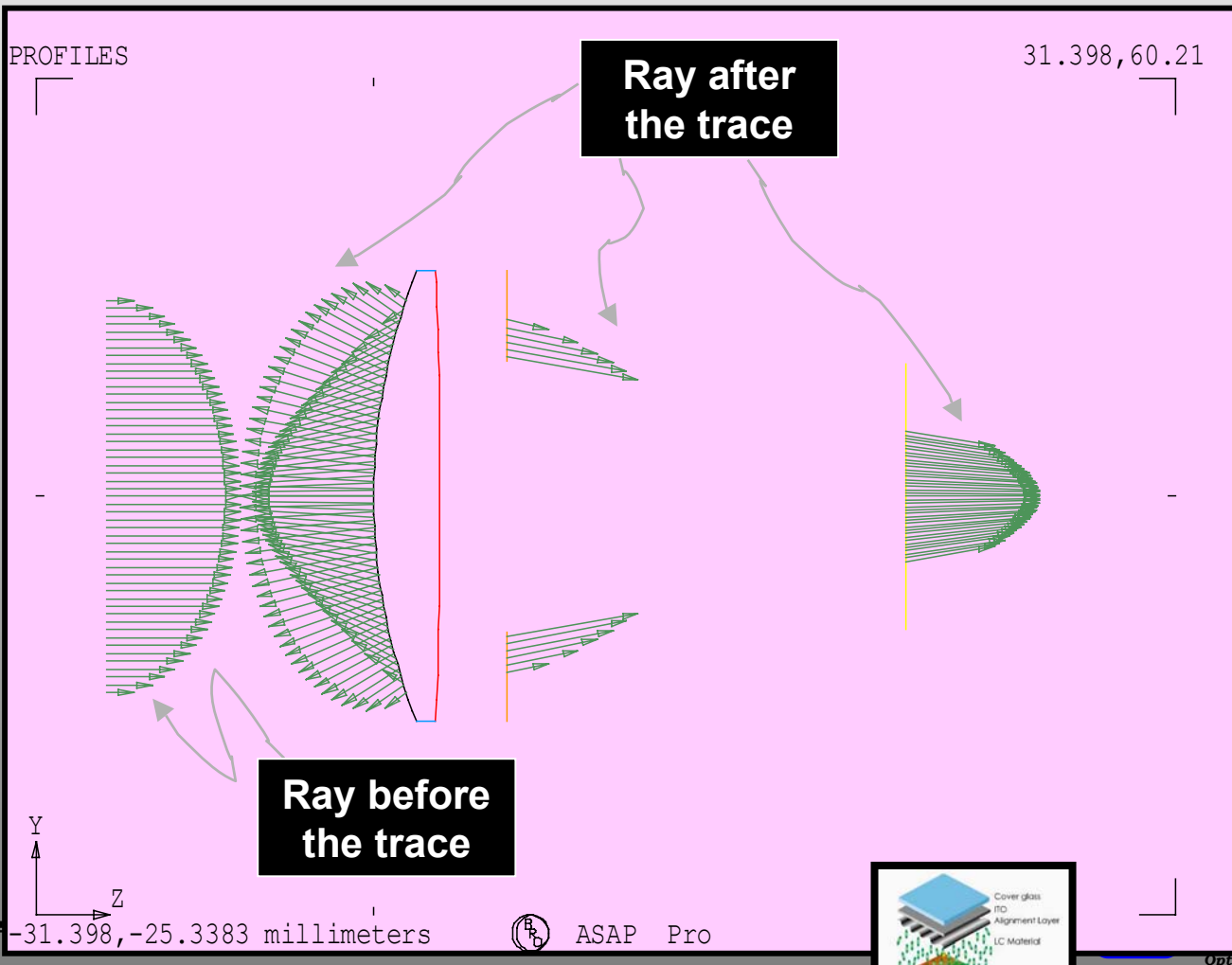


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Trace?How? B

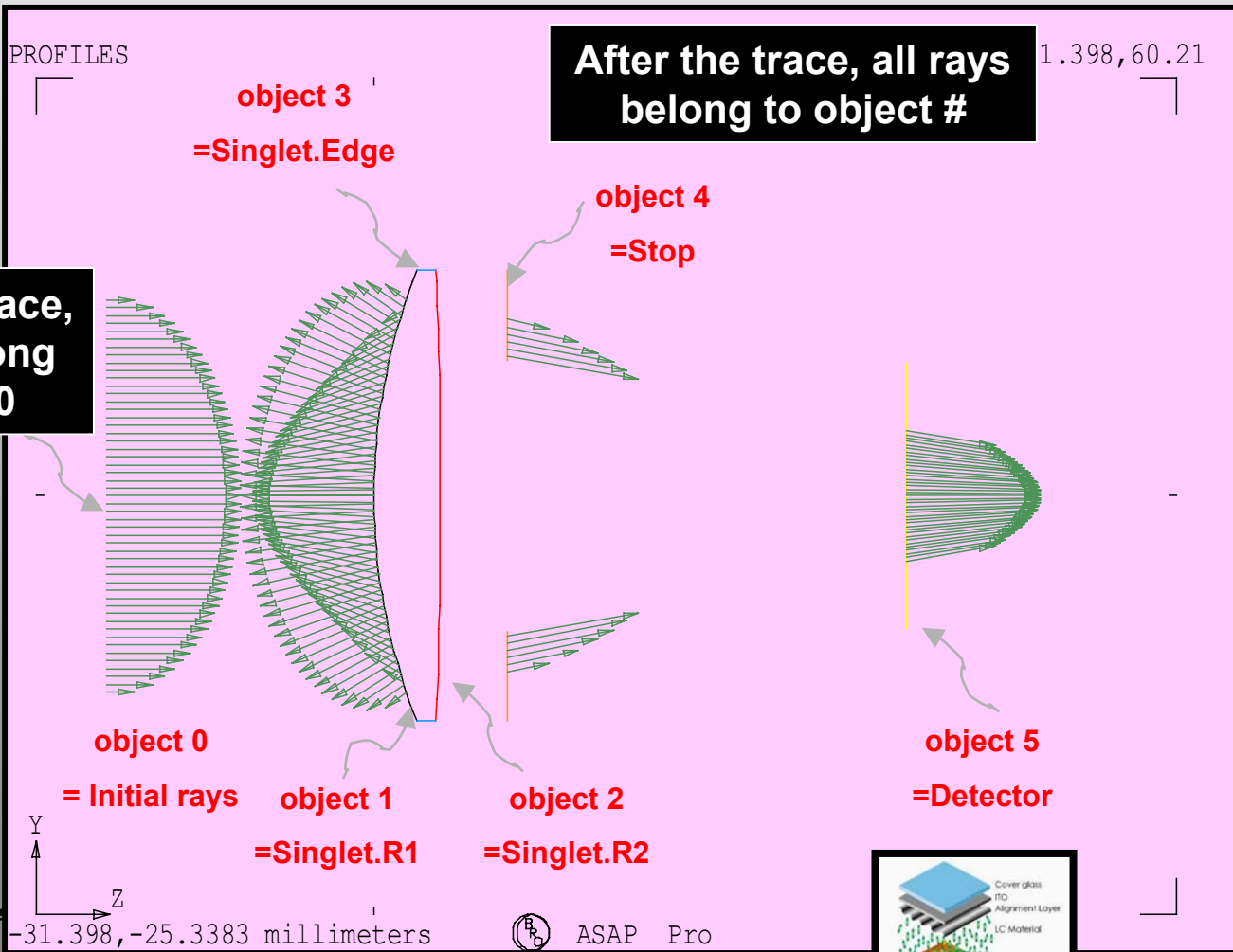
Each ray has a position 、 direction and power



Trace?How? C

Rays are belong to an object

Before the trace,
all rays belong
to object 0



Analysis? How?

1. Calculate total flux on the object

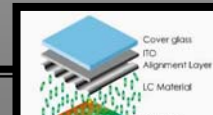
STATS

2. Create spot diagram

SPOT POSITIONS

3. Find best focus

FOCUS, FOCUS MOVE



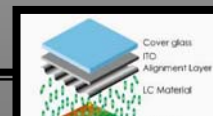
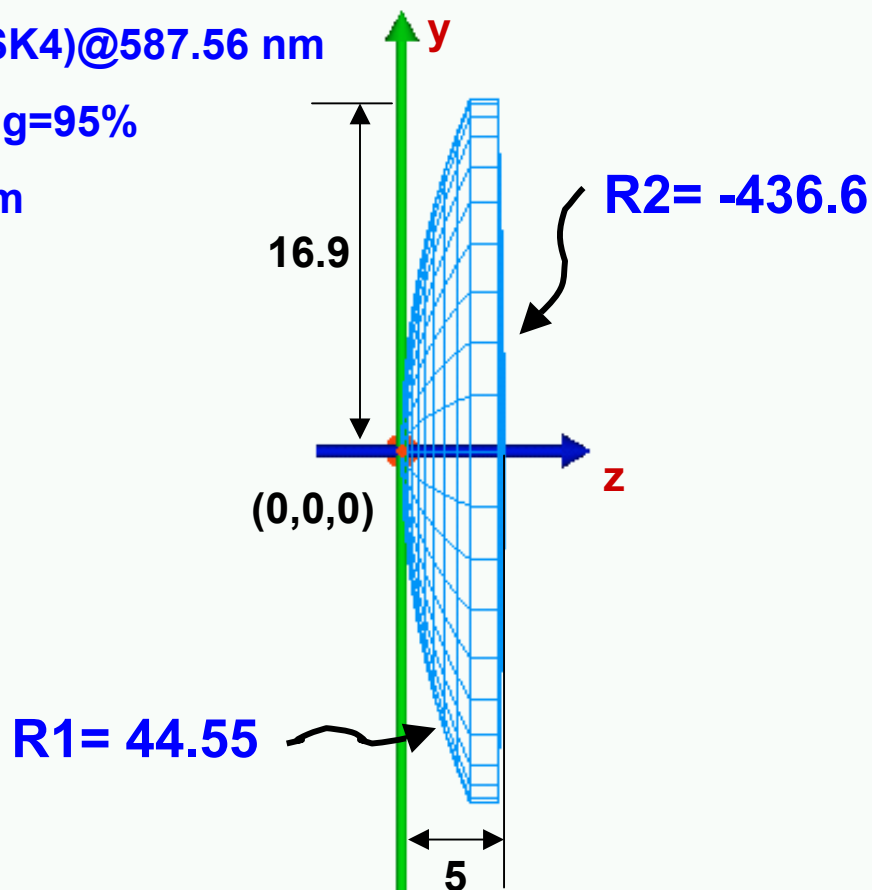
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Singlet lens example

$N=1.613(\text{SK4})@587.56 \text{ nm}$

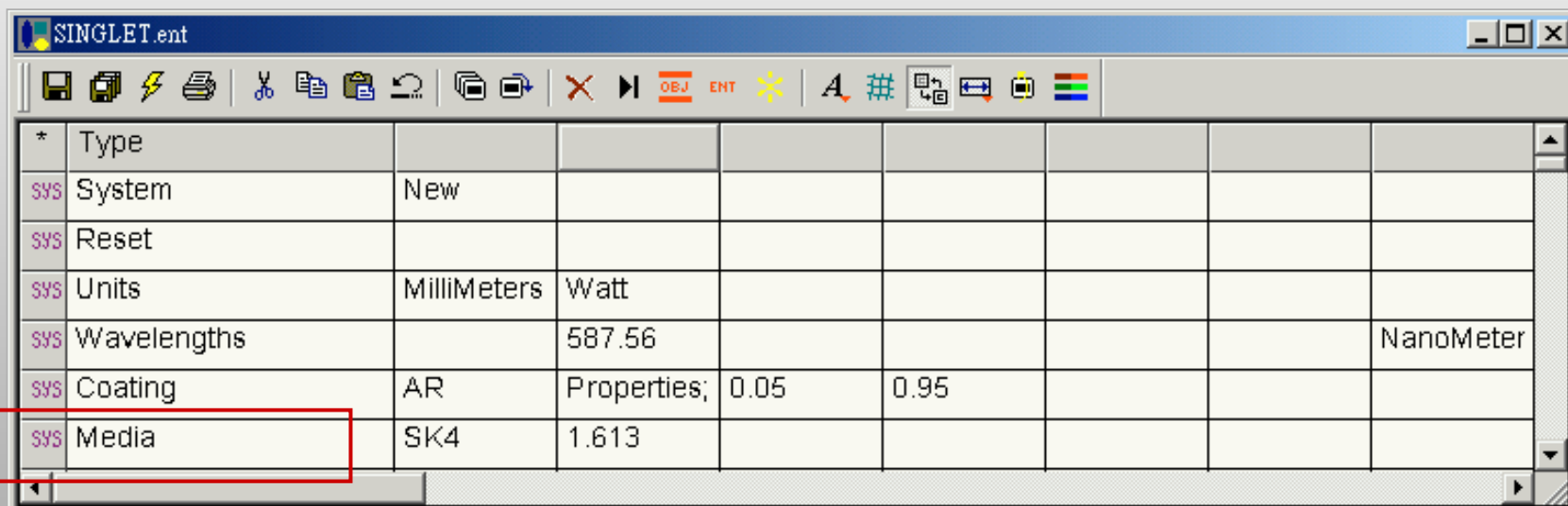
AR coating=95%

Units : mm



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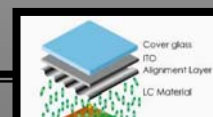


Click "F1" for help

$N=1.613(\text{SK4})@587.56 \text{ nm}$

AR coating=95%

Units : mm



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Source Type: GRID ELLIPTIC, $y=-10\sim10, x=-10\sim10, ray=21\times21$

Source Position: $z=-1$

Source Direction: $+z$

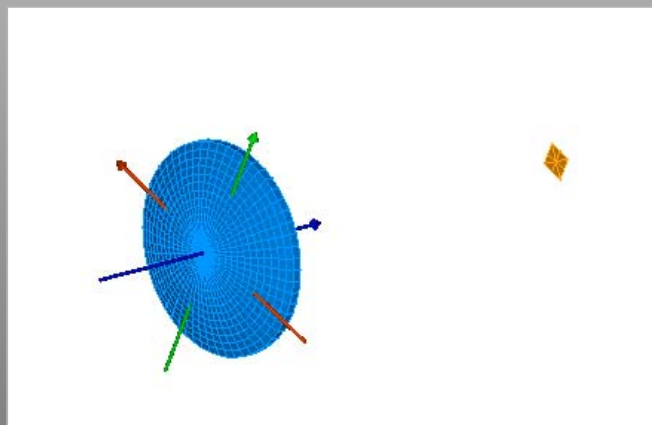
Detector Type: Plane ,Rect, $y=-2\sim2, x=-2\sim2$

Detector Position: $z=42$

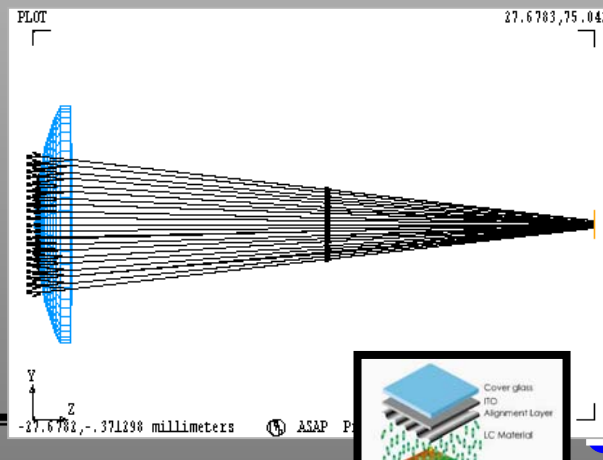
Step1:Build up source in builder

*	Type	Name	Axis	Location	Aperture	Semiwidth X	Semiwidth Y	Obs Ratio	Offset X'	Offset Y'
OBJ	Plane		Z	75	Rectangle	2	2			
	Type	Cmd	Axis	Position	Major Axis Min	Major Axis Max	Minor Axis Min	Minor Axis Max	Major Axis Rays	Minor Axis Rays
CM1	Grid	Elliptic	Z	-1	-10	10	-10	10	21	21
*	Type	Cmd	Vectc	Vector B	Vector C	Random	Angle			
MOD	Source	Dir	0	0	1					

Step2:Plot facets overlay



Step3:Trace plot

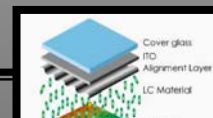


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ASAP Command Script

You Can have
MORE DETATILS for your
SCIENTIFIC RESEARCH!



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Singlet Command

(2) Geometry

```
SYSTEM NEW
UNITS  CENTIMETERS

WAVELENGTHS  .55  MICRONS

MEDIA  0
  1.0  'AIR'
  1.5  'GLASS'

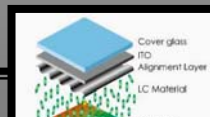
COATING PROPERTIES
  0.0  0.0  'ABSORB'
  0.0  1.0  'TRANSMIT'
  1.0  0.0  'REFLECT'
  .04  .96  'LENS_COAT'
```

(1) System

```
?Object 1  (LENS_FIRST_SURF)
SURFACE
  CARTOVAL  2  0  -1.0E6  1  24  1.5,
              ELLIPSE 1.2 1.2 0 0 0
OBJECT; .1  'LENS_FIRST_SURF'
  INTERFACE COATING  "LENS_COAT"  "AIR"  "GLASS"

?Object 2  (LENS_SECOND_SURF)
SURFACE
  CARTOVAL  2  .25  23.75  1.5  8  1,
              ELLIPSE 1.2 1.2 0 0 0
OBJECT; .1  'LENS_SECOND_SURF'
  INTERFACE COATING  "LENS_COAT"  "GLASS"  "AIR"

?Object 3  (DETECTOR)
EDGE
  ELLIPSE  2  8.25  .25  .25  16  0  360
OBJECT; .1  'DETECTOR'
  INTERFACE COATING  "ABSORB"  "AIR"  "AIR"
```



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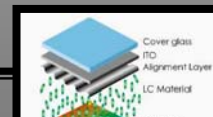
(3) Source

```
RAYS 0
!Source 1 (ON_AXIS_FAN) - COHERENT
WAVELENGTH .55
PARABASAL 4; WIDTH 1.6
POLARIZ OFF
GRID ELLIPTIC 2 -1 -1 1 -1 1 1 9
SOURCE DIRECTION 0 0 1
USERAPOD POS OFF
POLARIZ OFF
```

```
!Source 2 (OFF_AXIS_FAN) - COHERENT
WAVELENGTH .55
PARABASAL 4; WIDTH 1.6
POLARIZ OFF
GRID ELLIPTIC 2 -1 -1 1 -1 1 1 9
SOURCE DIRECTION 0 0.025 1
USERAPOD POS OFF
POLARIZ OFF
```

```
!Source 3 (ON_AXIS_FILL) - COHERENT
WAVELENGTH .55
PARABASAL 4; WIDTH 1.6
POLARIZ OFF
GRID ELLIPTIC 2 -0.1 -1 1 -1 1 15 15
SOURCE DIRECTION 0 0 1
USERAPOD POS OFF
POLARIZ OFF
```

```
!Source 4 (OFF_AXIS_FILL) - COHERENT
WAVELENGTH .55
PARABASAL 4; WIDTH 1.6
POLARIZ OFF
GRID ELLIPTIC 2 -.1 -1 1 -1 1 15 15
SOURCE DIRECTION 0 0.025 1
USERAPOD POS OFF
POLARIZ OFF
```



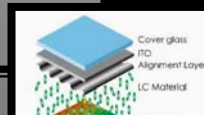
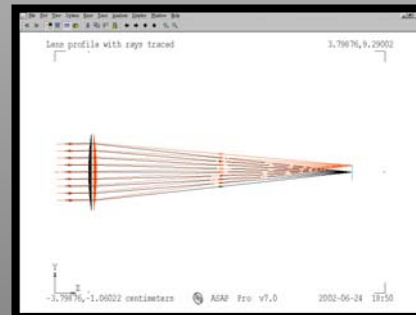
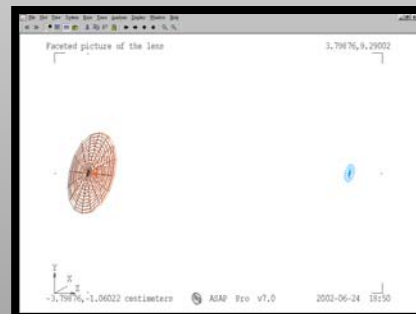
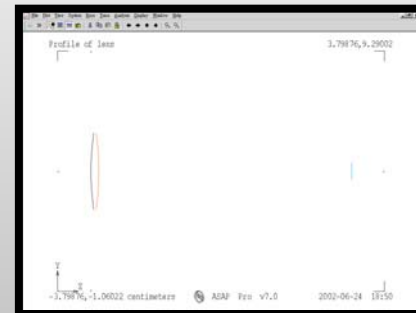
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Singlet Command

(4) Check & Trace

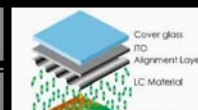
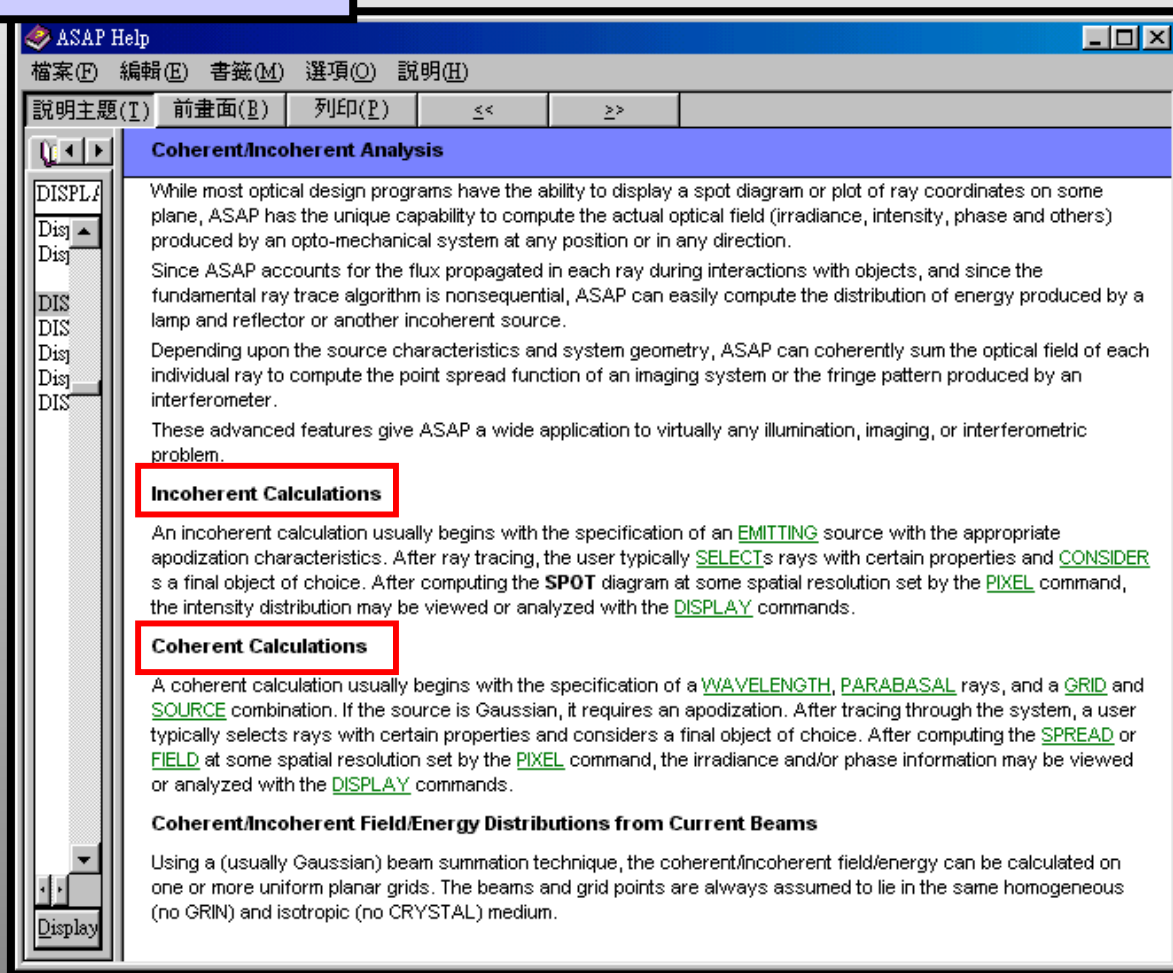
```
WINDOW Y Z           !Set graphics window orientation
WINDOW 1.25           !Additional 25% scale factor in size
PROFILES 'Profile of lens'
!!
!! Oblique faceted view
!!
OBLIQUE               !Set window to 3D oblique mode
PLOT FACETS 3 2 'Faceted picture of the lens'
!!
!! Profile with rays traced
!!
$IO VECTOR REWIND     !Reset 3D vector plot file
OBLIQUE OFF           !Make sure we are not in oblique mode
SELECT ONLY SOURCE 1 OR SOURCE 2
PLOT FACETS 3 2 OVERLAY 'Lens profile with rays traced'
TRACE PLOT
!!
!! 3D viewer
!!
$VIEW                 !Use faceted picture data in 3D viewer
```



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Singlet Command



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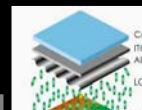
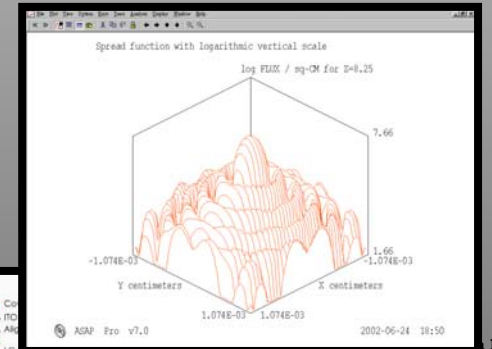
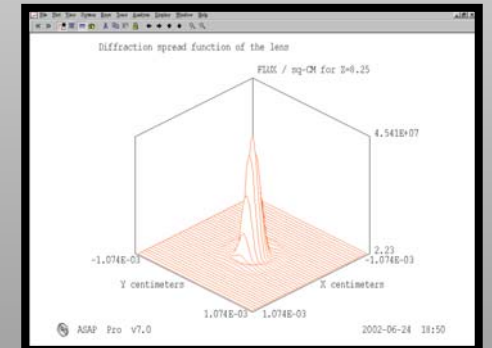
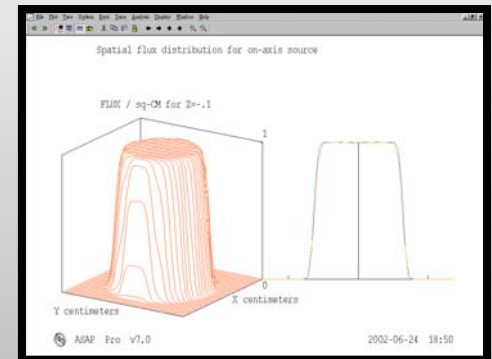
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Singlet Command

(5) Analysis 1/2

```
singlet_analyses

!!
!! Preliminary
!!
SPLIT 0           !Do not allow ray splitting
PIXELS 39
CONSIDER ALL
!!
!! Show the on-axis source before the ray trace
!!
SELECT ONLY SOURCE 3
WINDOW Y X
WINDOW 1.2
SPREAD NORMAL
DISPLAY
PLOT3D 'Spatial flux distribution for on-axis source'
!!
!! Trace the source and look at spread function
!!
TRACE
CONSIDER ONLY DETECTOR
STATS POSITION
W=1.22*0.55*8      !Size via 1.22*lambda*Fnum
W=2*1.0E-4*W.      !Window size (4 Airy rings, scale to sys units)
WINDOW Y -W. W. X -W. W.
SPREAD NORMAL
DISPLAY
ISOMETRIC 'Diffraction spread function of the lens'
FORM -6
ISOMETRIC 'Spread function with logarithmic vertical scale'
!!
!! Trace off-axis source and look at spread function
```

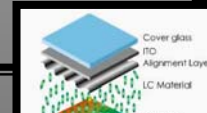
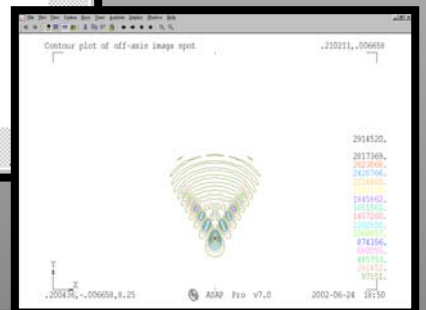
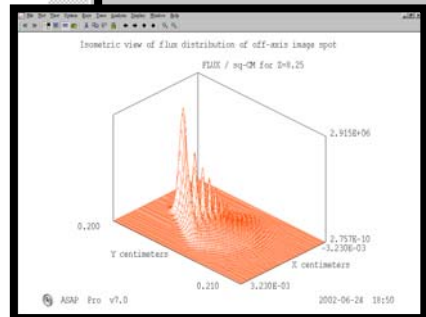
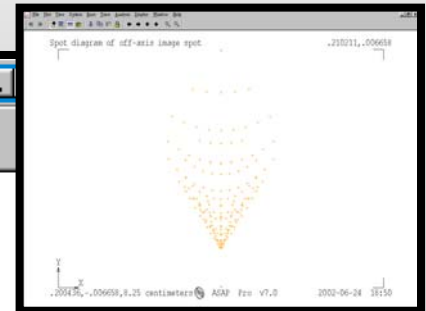


Singlet Command

(5) Analysis 2/2

```
singlet_analyses

!!
!! Trace off-axis source and look at spread function
!!
CONSIDER ALL
SELECT ONLY SOURCE 4
TRACE
CONSIDER ONLY DETECTOR
PIXELS 201
WINDOW Y X
WINDOW 1.5
SPOTS POSITION ATTRIBUTE 1 'Spot diagram of off-axis image spot'
SPREAD NORMAL
DISPLAY
ISOMETRIC 'Isometric view of flux distribution of off-axis image spot'
CONTOUR 15 'Contour plot of off-axis image spot'
PICTURE
RETURN
```



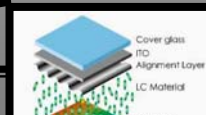
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Advance Topics in ASAP

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End of this trip,
hope you can enjoy it !

- 
- OBJECT
 - 5 STEPS
 - 3 IDEAS



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