

GDE-Geometrical Detector Analysis

The Geometrical Detector Analysis option (GDE) measures the relative proportion of passable rays at each field angle; convolving of a circular detector with the spot diagram is also possible. Diffraction is ignored.

When to Use the Geometrical Detector Analysis Option

Use the Geometrical Detector Analysis (GDE) option to determine the light falling on a detector of a defined size and shape (circular or rectangular) as a function of its location in the image. Diffraction is ignored; only the geometrical image is considered.

Default Operation

Rays in a uniform pupil grid are traced; tables give the number of rays which passed through the system as a function of wavelength, field and zoom position.

Command Mnemonics (alphabetical)

DEX

DEY

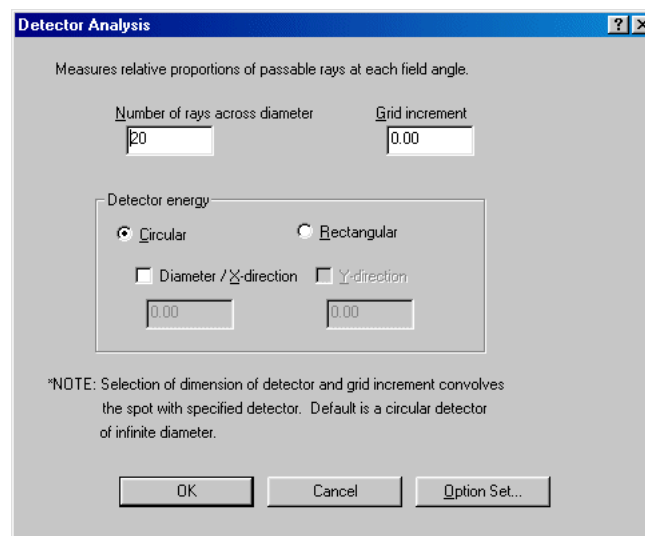
GRI

NRD

Defining Geometrical Detector Analysis Settings

To define settings for the Geometrical Detector Analysis (GDE) option, choose the **Analysis > Geometrical > Detector Analysis** menu. The **Detector Analysis** dialog box displays; define the controls in this dialog box as described in the table below.

For more details about how these controls are used, go to “What to Include in the LDM Data” on page 19-209.



Command Syntax		
Screen Control	Explanation	Default
NRD num_rays_across_diameter		
Number of rays across diameter	Specifies number of rays across grid traced through pupil in each wavelength.	20
GRI detector_incr....z		
Grid increment	Use with Diameter/X-direction setting (DEX). Changes the default image surface grid.	Diameter/X-direction /20 (DEX/20).
DEX No x_dim_of_detector....z		
Detector energy: Diameter/X-direction	Includes convolution in the nominal image surface with a detector of the specified dimension. Adds a 21 x 21 display of points in the image showing the energy on the detector when it is centered at each of those points. Circular Selects a circular detector with a dimension equal to the value specified in the Diameter/X-direction field. Rectangular Selects a rectangular detector of the specified X and Y dimensions given in the Diameter/X-direction and the Y-direction fields. From the command line: If DEX only is given, it is a circular detector with diameter equal to x_dim_of_detector; if both DEX and DEY are given, it is a rectangular detector of the specified X and Y dimensions.	No.
DEY No y_dim_of_detector....z		
Detector energy: Y-direction	Use only with Diameter/X-direction field (DEX) to specify a rectangular detector; you also must select the Rectangular radio button. Designates the detector to be rectangular with the given Y dimension (y_dim_of_detector).	No.

Discussion of Input and Computations

What to Include in the LDM Data

No added LDM data is required.

The Geometrical Detector Analysis (GDE) option traces rays through a uniform grid on the entrance pupil and gives the number of rays which passed through the system as a function of wavelength, field, and zoom position. The same number of rays is attempted at all wavelengths.

The number of rays to be traced across the grid traced through the pupil in each wavelength can be specified (**Number of rays across diameter** setting or **NRD**). The actual **NRD** used is slightly different from the specified (or default) **NRD**, due to a rounding algorithm used internally. Selection of a circular detector dimension (**Radius/X-direction** setting or **DEX**) will include convolution in the nominal image surface with a detector of the specified dimension. A 21 x 21 array of points is produced representing the convolution of the detector with the geometrical point spread function (**PSF**). The center of the array corresponds to the detector being centered on the chief ray image location for the reference wavelength. Each value in the array represents the relative percentage of energy reaching the detector at that point relative to the chief ray. A rectangular detector is analyzed if a Y dimension is also given (**Y-direction** setting or **DEY**). The spacing between the points in the convolution requested by **DEX** can also be selected (**Grid increment** setting or **GRI**), but defaults to approximately **DEX/20**.

Description of Output

Tables are listed for each request giving the number of rays passing through the system as a function of wavelength, field, and zoom position. If **DEX/DEY** are represented, a 21 x 21 grid of points representing the convolution of the PSF with the specified detector is also printed (see output example).

Example 1. Listed GDE output (only one field is shown).

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POSITION 1          GEOMETRICAL OPTICS DETECTOR ENERGY ANALYSIS

Double Gauss - U.S. Patent 2,532,751
FIELD (X,Y) = ( 0.00, 1.00)MAX, ( 0.00, 14.00)DEG

SCALE - ONE INCREMENT = 0.020000 MILLIMETERS

CIRCULAR DETECTOR   DIA. = 0.200000

The array below represents a convolution of the detector with
the geometrical point spread function (PSF). Each value in the
array represents the relative percentage of energy reaching the
detector at that point.

100 corresponds to 94.697 percent for this field of view.

100 corresponds to 52.743 percent W.R.T. first field of this zoom.
100 corresponds to 52.743 percent W.R.T. first field - first zoom position.

For a centered detector, total energy W.R.T. this field is 94.697
For a centered detector, total energy W.R.T. first field - first zoom is 52.743

```

	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	1	1	1	1	1	3	6	3	1	1	1	1	1	0	0	0	0
4	1	1	1	1	2	2	3	12	28	41	45	41	28	12	3	2	2	1	1	1	1
3	2	2	2	2	3	4	21	48	70	81	84	81	70	48	21	4	3	2	2	2	2
2	2	2	3	3	4	16	48	78	93	97	96	97	93	78	48	16	4	3	3	2	2
1	2	3	3	3	7	32	72	94	99	99	98	99	99	94	72	32	7	3	3	3	2
0	2	3	3	3	13	42	82	98	99	99	100	99	99	98	82	42	13	3	3	3	2
-1	2	3	3	4	15	49	85	99	99	99	100	99	99	99	85	49	15	4	3	3	2
-2	2	3	3	3	13	43	83	98	99	99	100	99	99	98	83	43	13	3	3	3	2
-3	1	2	2	3	8	31	70	97	99	98	98	98	97	70	31	8	3	2	2	2	1
-4	1	1	2	2	3	17	49	79	97	97	97	97	97	79	49	17	3	2	2	1	1
-5	0	0	1	1	2	5	20	47	68	84	88	84	68	47	20	5	2	1	1	0	0
-6	0	0	0	0	1	1	4	15	27	39	43	39	27	15	4	1	1	0	0	0	0
-7	0	0	0	0	0	0	0	1	4	8	9	8	4	1	0	0	0	0	0	0	0
-8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Command inputs:

RES CV_LENS:DBGAUSS

GDE

DEX 0.2 ! Define circular detector of 2 mm

GRI 0.02 ! Grid increment

GO

Figure 1. Example of GDE output