

**NAME**

saotrace.raygen.sources – standard raygen sources

**SYNOPSIS**

```
require( 'saotrace.raygen.sources.point' )
```

**DESCRIPTION****point**

**raygen** specification for a single point source. The point source may have a single energy, multiple energies, a flat spectrum, or a spectrum in a file.

There are two things that really must be specified: the output spectrum and the source position.

*Output Spectrum*

This source can handle several different types of spectra. This is all done by setting up a single variable, `energy`.

A single energy:

Set `energy` equal to the energy [keV] and the variable 'flux' to the flux [photons/s/cm<sup>2</sup>]

```
energy = 1.49
```

A list of discrete energies each with the same flux:

Set `energy` equal to a table of energies [keV] and the variable 'flux' to the flux [photons/s/cm<sup>2</sup>].

```
energy = { 1.49, 4.51 }
```

A list of discrete energies with different fluxes:

Set `energy` equal to a table of tables, where each subtable contains the energy [keV] and flux [photons/s/cm<sup>2</sup>]. e.g.

```
energy = { {1.49, 0.5}, {4.51, 1.25} }
```

A list of discrete energies with different fluxes in a file

Set `energy` equal to a table, with a named element, `picket`, which is itself a table with the following keys:

```
- file           : name of RDB table
- energy         : column which contains energy, in keV
- flux           : column which contains flux
```

the latter default to 'energy' and 'flux'. if flux is set to the string 'NONE', then all energies will have a flux of 1

```
energy = { picket = { file = 'foo.rdb' } }
```

A flat spectrum:

Set `energy` to a table, with a named element, `flat`, which is itself a table with the minimum and maximum energies [keV], and the flux [photons/s/cm<sup>2</sup>] (just like the raygen `flat()` generator). For example,

```
energy = { flat = { 1.49, 5.0, 0.75 } }
```

The flux is optional and defaults to 1 photon/s/cm<sup>2</sup>.

A spectrum in a file:

Set `energy` to a table, with a named element, `specfile`, which is itself a table with the following keys:

```

- file
- format
- emincol
- emaxcol
- fluxcol
- units
- scale

```

These have the same meaning as the arguments to the raygen provided *spectrum()* function. The file key must be provided. For example,

```
energy = { specfile = { file = 'foo.rdb' } }
```

You may combine all of the table based options:

```
energy = { 1.49 ; specfile = { ... }, flat = { 1.59, 5.0 } }
```

The different spectra are added together.

### Source Position

The axial distance to the source is given by the variable 'z', where z is 0 at CAP datum A, and z increases from the source to the focal plane. If z is not specified, it is -Infinity. Note that the zero point is *\*not\** at the telescope node. This is an issue only if the source is *\*really\** close to the telescope.

The focal plane position of the source may be specified in one of several coordinate systems. The coordinate system is specified via the 'coord' variable, which may have one of the following values:

raygen

The native raygen polar coordinate system. This is the default. Set the following variables:

```
theta - off axis angle in arcminutes
phi   - azimuthal angle in degrees

```

elaz

OSAC elevation and azimuth. Set the following variables:

```
el - elevation in arcminutes
az - azimuth in arcminutes

```

msc

Mirror Spherical Coordinates. This is the on-orbit polar coordinate system. This makes an assumption about the relative orientations of the MSC and OSAC coordinate systems. Set the following variables:

```
theta - off axis angle in arcminutes
phi   - azimuthal angle in degrees

```

offset

orbit offset pointing. This also makes assumptions about the relative orientations of the orbit HRMA and OSAC coordinate systems. See the POG for more information on offset pointing. Specify the following variables:

```
yoff - Y offset in arcminutes
zoff - Z offset in arcminutes

```

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