Contents

Introduction

In the following, we will given an overview on the structure of a XML file, which can be used as an input for the setup of the scene and for a couple of different calculation processes. Firstly, the principle structure will be discussed. Please note that all lengths are given in µm. After the usual preamble of the XML file, everything is encapsulated in the Root entry, i.e. <Root> ... <\Root>. In the following, the term "section" is used for a closed part which is encapulated by <Sectionname> ... <\Sectionname>. Within the root section, there are two possible subsections, the Scene section, which describes the whole structure of the scene with all light sources, objects etc. and the calculation section where the calculation parameters are described. As values there are strings, integer or floating point numbers, threedimensional vectors and complex numbers. **Threedimensional vectors** are given by the x,y and z component. Default values for missing coordinates is always 0.
example:

```
<Position x="2.3" y="4.5" z="-5.6" />
```

A **complex number** is given its real and its imaginary part:

```
<n real="1.5" image="0.1"/>
```

Chapter 1

Scene

Within this section, all elements like light sources, objects and detectors are described. The scene has the parameter: the radius of the calculation space r0.

1.1 Light sources

All light sources have some entries which are used for all types. All parameters are optional. If one parameter is missing, it will be set to its default value, which is given in a table below.

Parameters used for all light sources

Parameter name	description	possible value	default value
Type	type of the light source	"plane","gaussian" "ring","tophat" "plane_mc" "gaussian_mc" "ring_mc" "gaussian_ring_mc"	–
Position	position of the light source (center of the area)	3D vector	–
NumRays	Number of rays per calculation step	integer number	–
Size	width of the light source	floating point number	–
Wavelength[1]	Wavelength of the light source	floating point number	1.0

[1]For pulsed calculation, this wavelength will be overwritten

1.1.1 Plane wave

type: **plane**
This type is the most simplest type of light source. This is a plane wave in which the rays are emitted equally distributed. The number of rays here only refers to one direction, i.e. the total number of rays is the square ($Numrays^2$). The distance between two adjacent rays is $Size/NumRays$. The only special parameter is

Parameter name	description	possible value	default value
Direction	Direction of the plane wave	3D Vector	–

1.1.2 Plane wave (mc)

type: **plane_mc**
All light sources denoted with "mc" are those where the rays are arbitrarily distributed. Unlike in the case of the plane wave, the total number of rays is equal to NumRays. Also here, the only special parameter is "Direction".

1.1.3 Gaussian wave

type: **gaussian**
A gaussian wave describe a wave which is focused towards the focal point and has a gaussian radial intensity distribution. The direction of the wave is given by the position of the light source and the focal point. For the description of the gaussian distribution, one can either give the (virtual) waist width at the focal point, w0 or the numerical aperture NA. If both are given, the numerical aperture is used. Special parameters:

Parameter name	description	possible value	default value
w0	(virtual) waist at the focal point	floating point number	1.0
NA[2]	numerical aperture	floating point number	

1.1.4 Gaussian wave (mc)

type: **gaussian_mc**
The same as the normal gaussian wave, except that the distribution of the rays is arbitrary and the intensity distribution is given by the density of the rays.

[2] if w0 and NA are given, NA is used

1.1.5 Ring shaped light source

type: **ring**
A light source, shaped like a ring with equally distributed rays. The ring is described by its inner and outer radius.

Parameter name	description	possible value	default value
rmin	inner radius (≥ 0)	floating point number	0
rmax	outer radius	floating point number	100
Direction	direction of the light rays	3D vector	–

1.1.6 Ring shaped light source (mc)

type: **ring_mc**
Like ring shaped light source, except that the rays are distributed arbitrarily.

Example for a scene with one light source

```
<?xml version="1.0" encoding="utf-8"?>
<Root>
  <Scene r0="4E+4">
    <nS imag="0.0" real="1.0" />
    <LightSources>
      <LightSource NumRays="100000" Size="1500" Type="ring_mc"
       Wavelength="1.0"
       rmax="500" rmin="0">
        <Position x="0.0" y="0" z="-1E+4" />
        <Direction x="0.0" y="0" z="1" />
      </LightSource>
    </LightSources>
 </Root>
```

Beside these general parameters, every type of light sources have there own special parameters

1.2 Objects

Like the light sources, all objects have some general parameters. Those parameters can be seen in the following table

Parameter name	description	possible value	default value
Type	Type of the object	"ellipsoid","surface" "cone","aspheric_lens" "spheric_lens","box"	–
Pos	Position of the object[3]	3D Vector	–
Alpha	rotation angle around x-axis	double (in radiants)	0
Beta	rotation angle around y-axis	double (in radiants)	0
Gamma	rotation angle around z-axis	double (in radiants)	0
isActive	for pulse calculation and inelastic: if true, the field inside the object will be stored	true, false	false
n	refractive index	complex number[4]	real: 1.0, imag: 0.0

Ellipsoid

type: **ellipsoid**
This object type describes an elliptic object, defined by the three semi-axis, according to

$$\frac{(x-x_c)^2}{a_x^2}+\frac{(y-y_c)^2}{a_y^2}+\frac{(z-z_c)^2}{a_z^2}=1 \tag{1.1}$$

The position is defined by the center of the ellipsoid (x_c,y_c,z_c).

Parameter	description	possible value	default value
Dimension	Vector, which holds the semi-axes as components	3D Vector	(10,10,10)

[3]Reference point for the object differ from shape to shape

[4]Complex numbers have two components: real and imag for the real and the imaginary part

Box

type: **box**
This object type describes a cuboid, defined by the edge lengths. The center of the cuboid is used as position (reference point).

Parameter	description	possible value	default value
Dimension	Vector, which holds the edge lengths in x-, y- and z-direction	3D Vector	(10,10,10)