phase4idl — a brief description

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IDL-Routinen

1 phainit.pro

pro phainit

Initializes phase4idl:

The path to the shared library is defined here as well as various system variables.
All used modules and structures are loaded.

No arguments.

2 phase_structures.pro

This file contains the definition of the phase4idl structures.

3 phaProp.pro

pro phaPropFFTnear, beam, distance

Calculates the propagation of the EM-Near-Field using a Fast-Fourier-Transform-Algorithm

Arguments:

beam	Structure of type Source4
distance	propagation distance

pro phaPropFFTfar, beam, distance

Calculates the propagation of the EM-Far-Field using a Fast-Fourier-Transform-Algorithm

Arguments:

beam	Structure of type Source4
distance	propagation distance

pro phaPropWFFresnelKirchhoff,beam,distance,nz2,zmin2,zmax2,ny2,ymin2,ymax2

Calculates the propagation of the EM-Field using the Fressnel-Kirchhoff equations.
Hereby all gridparameters can be changed.

Arguments:

beam	Structure of type Source4
distance	propagation distance
nz2,nz2	New number of gridpoints in x/z-direction
x/zmin2,x/zmax2	New gridparameters in x/z-direction in mm

4 phaSrcWFGauss.pro

function phaSrcWFGauss,ianzz,zmin,zmax,ianzy,ymin,ymax,w0,dist,xlam

Creates a gaussian-shape source, polarized in z-direction

Input-Arguments:

beam	Structure of type Source4
ianzz,ianzy	Number of gridpoints in x/z-direction
x/zmin,x/zmax	Gridparameter in x/z-direction in mm
waist	Beamsize at Waist
dist	Distance to Waist
xlam	Wavelength λ in nm

Output-Arguments:

beam	Structure of type Source4

5 phaplotting.pro

Various helper functions for plotting the EM-Fields

function get_pha_src4_axis_z, beam

Reads the z-axis out of an source4-type beam-structure

function get_pha_src4_axis_y, beam

Reads the y-axis out of a source4-type beam-structure

pro phaIntensitySurface,beam,name

Phase 3D-Surface-Plot of the Intensity of a source4-type beam-structure; Grid-Style

pro phaIntensityShade_Surf,beam,name

Phase 3D-Surface-Plot of the Intensity of a source4-type beam-structure; Shade-Style

pro iphaIntensitySurface,beam,name

Phase 3D-Surface-Plot of the Intensity of a source4-type beam-structure; IDL-iTools-Style

pro phaRealSurface_Ez,beam,name

Phase 3D-Surface-Plot of the Real-Part of a source4-type beam-structure; Grid-Style; Ez only

pro phaRealShade_Surf_Ez,beam,name

Phase 3D-Surface-Plot of the Real-Part of a source4-type beam-structure; Shade-Style; Ez only

pro iphaRealSurface_Ez,beam,name

Phase 3D-Surface-Plot of the Real-Part of a source4-type beam-structure; IDL-iTools-Style; Ez only

pro phaImagSurface_Ez,beam,name

Phase 3D-Surface-Plot of the Imaginary-Part of a source4-type beam-structure; Grid-Style; Ez only

pro phaImagShade_Surf_Ez,beam,name

Phase 3D-Surface-Plot of the Imaginary-Part of a source4-type beam-structure; Shade-Style; Ez only

pro iphaImagSurface_Ez,beam,name

Phase 3D-Surface-Plot of the Imaginary-Part of a source4-type beam-structure; IDL-iTools-Style; Ez only

6 pha_src4_functions.pro

function phasrc4add, beam1, beam2

Calculates the sum of the EM-fields in 2 Source4-Beam-Structures, assuming that beam1 and beam2 have the same Grid-Parameters.

Input-Arguments:

beam1, beam2	Structures of type Source4

Output-Arguments:

beam	Structure of type Source4

function phasrc4diff, beam1, beam2

Calculates the difference between the EM-fields in 2 Source4-Beam-Structures, assuming that beam1 and beam2 have the same Grid-Parameters.

Input-Arguments:

beam1, beam2	Structures of type Source4

Output-Arguments:

beam	Structure of type Source4

pro phaLabelSrc4, beam, name

Labels the fsource4(a-d)-Tags in a source4-structure which contain the filenames, the EM-Field is saved to by PHASE.

Arguments:

beam	Structure of type Source4
name	Namestring of 80 or less characters

pro phaModSizeAddZeros,source4,nz2,ny2

Symmetrically adds zeros to the rim of the grid and also increases the gridsize-parameters.
If nz2 or ny2 are smaller than the values in the given source4, the routine has no effect.

Arguments:

source4	Structure of type Source4
nz2,ny2	New number of Gridpoints

pro phaModSizeCut,source4,nzmin,nzmax,nymin,nymax

Changes the upper and lower borders of the grid without changing the number of girdpoints.
If the new borders are out of the actual borders, no action is performed in the corresponding direction.

Arguments:

source4	Structure of type Source4
nzmin,nymin	Lower border of the grid in z/y-direction
nzmax,nymax	Upper border of the grid in z/y-direction

pro phaModGrid,source4,nz2,ny2

Changes the number of grid-points without changing the length-dimension of the grid. Other grid parameters like the distance between two grid-points are set to fit.

Arguments:

source4	Structure of type Source4
nz2,ny2	New number of Gridpoints

7 examples.pro

pro example1

This is a 6 step example to demonstrate phase4idl.

1) A new gaussian source with 193x67 points is created.
2) The number of gridpoints is changed to 128x128 without changing the lenght of the borders.
3) A near-field fft propagation over 2000mm is performed.
4) Now a 64x4 points rectangle is cut out if the beam to simulate a slit.
5) The rim is filled up with zeros again to a 256x256 grid.
6) The beam after the slit is now propagated over 15000mm via the far-field fft algorithm.

After each step the intensity is plotted into a 3x2 plot window.

pro example2

This is a 4 step example to demonstrate phase4idl.

1) A new gaussian source with 256x256 points is created.
2) Now the beam is propagated through a rectangular-slit (2x4) in the center of the beamline.
3) The rim is filled up with zeros again to a 256x256 grid.
4) The beam after the slit is now propagated over 1500mm via the near-field fft propagator.

After each step the intensity is plotted into a 2x2 plot window.