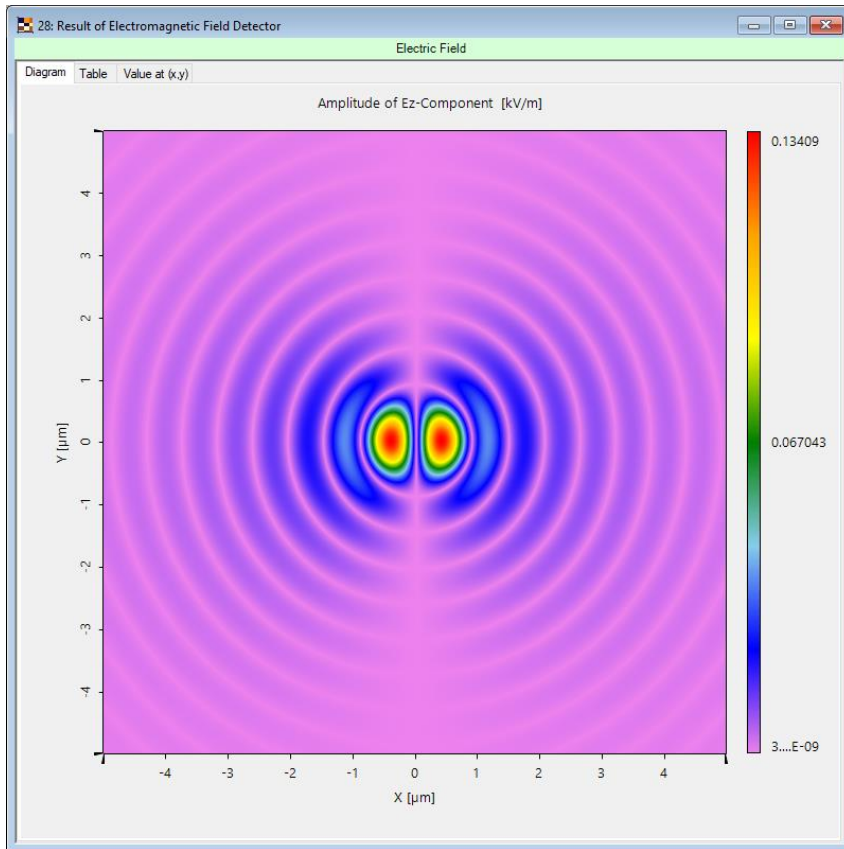


Electromagnetic Field Detector

Abstract



The fast physical optics theory facilitates the computation of electromagnetic fields in an optical system. With the Electromagnetic Field Detector in VirtualLab Fusion the user can access the fully vectorial electromagnetic field at any given plane in the system. It is possible to customize which components are to be shown, the color scheme in which they will be presented, and much more. We explain here how to handle this detector.

Modeling Task

27: Light Path View (C:\Users\...\Feature.0026_Electromagnetic Field Detector_01.lpd #26)

Light Sources
Coordinate Break
Components
Ideal Components
Camera Detector
Detectors
Analyzers

Spherical Wave 0

Electromagnetic Field Detector 600

Electromagnetic Field Detector 601

Ray Tracing System Analyzer 800

17: Electromagnetic Field Detector #601 after Spherical Wave #0 (-...)

Electric Field

Diagram Table Value at (x,y)

Amplitude of Ez-Component [kV/m]

Y [μm]

X [μm]

0.1341

0.067048

3.....E-09

Edit Electromagnetic Field Detector

Detector Window and Resolution Detector Function

Field Components

Ex-Component Ey-Component Ez-Component

Hx-Component Hy-Component Hz-Component

Field Quantities

Amplitude Only Amplitude and Phase

Phase Residuals Only Complete Phase

Output Data Arrays

Interpolation Method Cubic 6 Point

Color Lookup Table Reverse Rainbow

Field Zone for Detector Evaluation

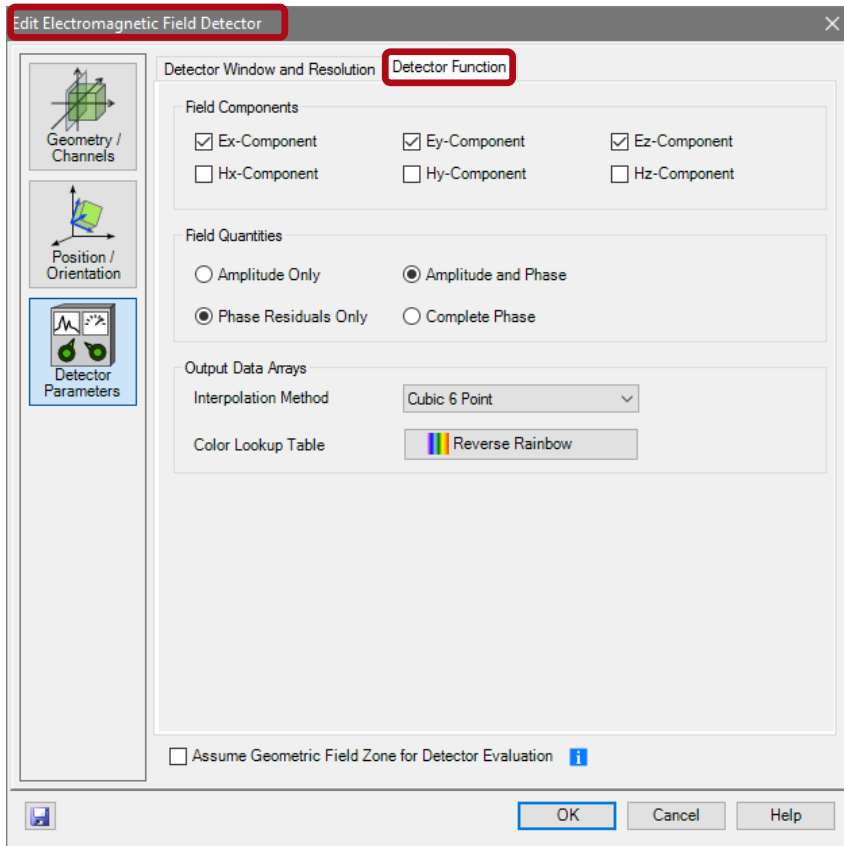
OK Cancel Help

How to configure and use
the Electromagnetic Field
Detector in VirtualLab
Fusion

Overview

- The electromagnetic field detector can be found in the section *Detectors* → *Field Visualization*.
- Its task is to calculate the electromagnetic field component and store the data into a data array which can be used for visualization of the components.
- The user has several options for customization of the detector output, which will be discussed within this use case.

Edit Options of Electromagnetic Field Detector



- The edit dialog of the electromagnetic field detector can be accessed by double clicking on the detector item within the light path diagram view.
- Several options can be preconfigured in the edit dialog.

Parameters of the Electromagnetic Field Detector

Parameter	Description
Field Components	The user can select which field components shall be calculated by the detector. The user can select whether to calculate E_x , E_y , E_z , H_x , H_y and/or H_z .
Field Quantities	<p>In the field quantity section it is possible to define which field quantities shall be stored in the data array. The user can select whether to show only the amplitude or amplitude and phase information.</p> <p>For amplitude and phase it is possible to select whether to show only the phase residual or the complete phase.</p>
Interpolation Method	By setting the interpolation method the user select the interpolation method used for visualization of the selected field components.
Color Lookup Table	The display of the field components is realized by a data array. The user can preconfigure the LUT used for viewing. The setting of the LUT can be changed later again by the user in the data array view.

Sample System for Electromagnetic Field Detector

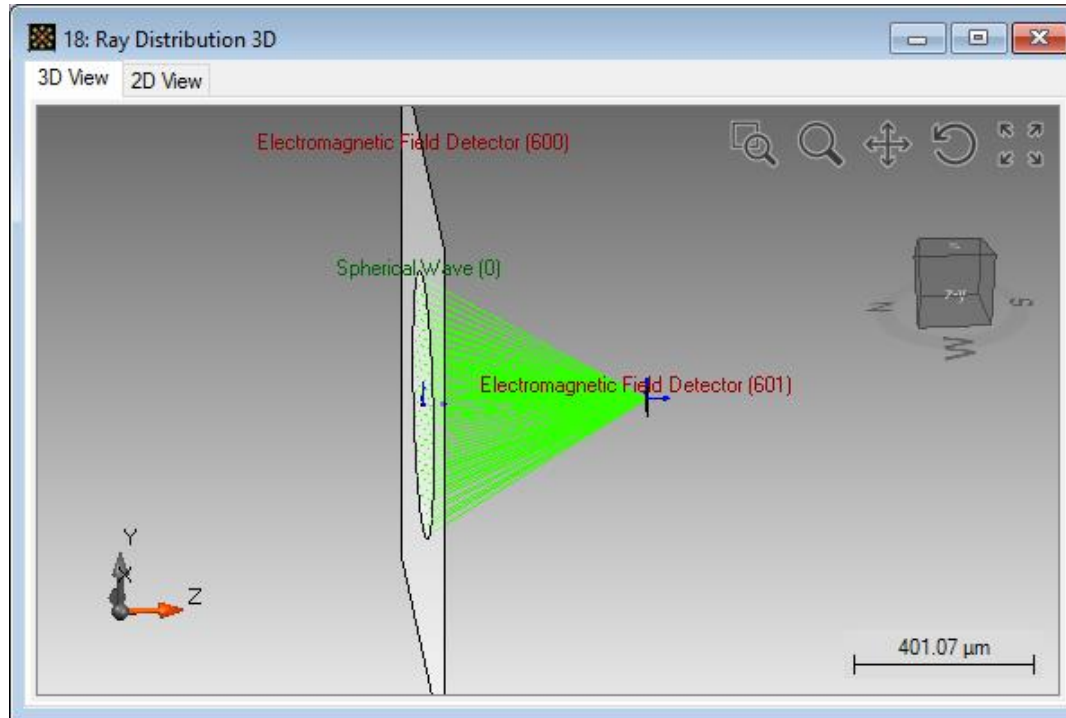
The image displays two windows from a simulation software interface. The top window, titled "10: Light Path View", shows a diagram of a light path. It starts with a "Spherical Wave" element (index 0) on the left. Two arrows originate from it: one points to an "Electromagnetic Field Detector" (index 600) at a distance of "Z: 0 m", and the other points to another "Electromagnetic Field Detector" (index 601) at a distance of "Z: 500 μm".

The bottom window, titled "9: Light Path Editor", shows a table with columns for "Start Element" and "Target Element". The "Start Element" column is further divided into "Index", "Type", "Channel", and "Medium". The "Target Element" column is divided into "Index" and "Type". A "Linkage" column is also present, with sub-columns for "Propagation Method" and "On/Off".

Start Element				Target Element		Linkage	
Index	Type	Channel	Medium	Index	Type	Propagation Method	On/Off
0	Spherical Wave	-	Air in Homogeneous Medi...				

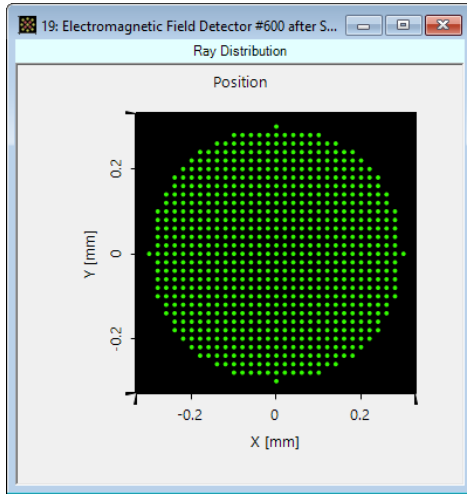
At the bottom of the "Light Path Editor" window, there is a "Simulation Engine" dropdown menu set to "Field Tracing 2nd Generation" and a "Go!" button.

Result of Ray Tracing System Analyzer



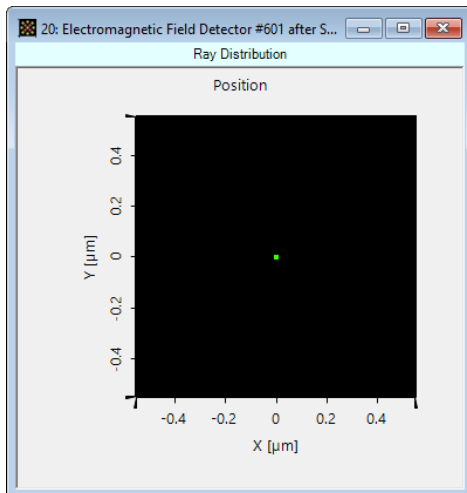
- The sample system contains a spherical wave and two E/H field detector. One is placed in the focus, and the other directly behind the source.
- The NA of the spherical wave is 0.7.

E/H Field Detector Output for Ray Tracing



After
Source

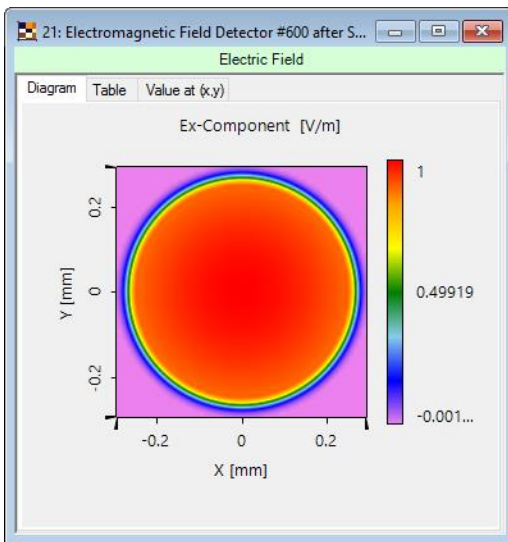
- If the user performs ray tracing analysis of the system which contains an electromagnetic field detector, a dot diagram showing the rays in the detector plane is shown.



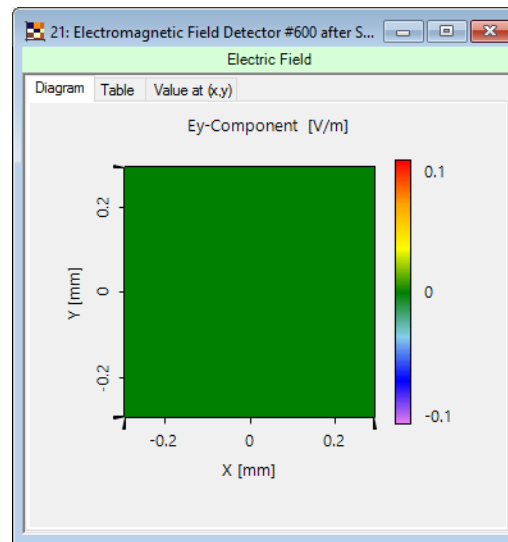
In Focus

E/H Field Detector after Source

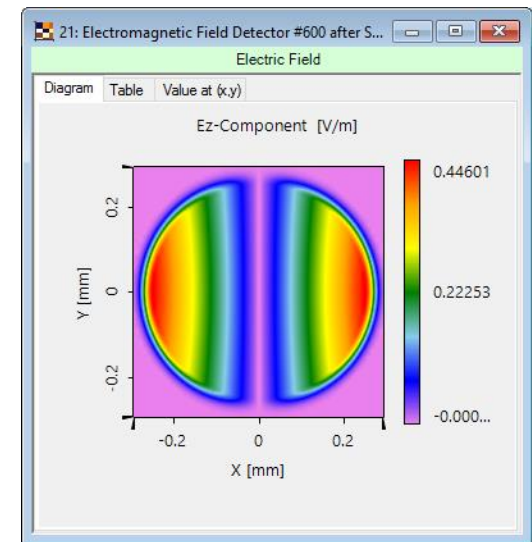
- The screenshots below show the output of the electromagnetic field detector directly behind the source.
- The detector is configured to show only amplitudes for E_x , E_y and E_z .



Amplitude of E_x

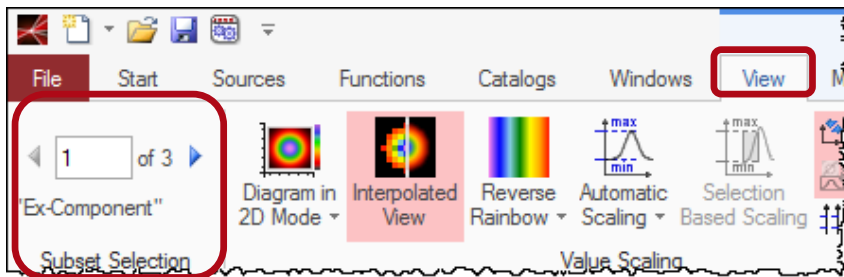


Amplitude of E_y



Amplitude of E_z

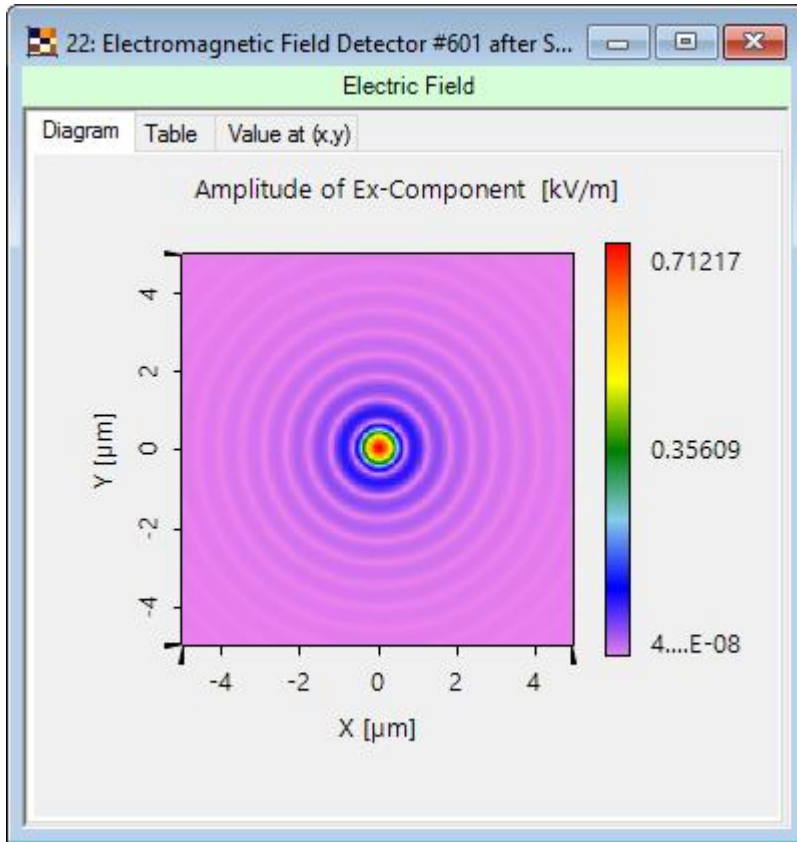
Switching Between E/H Field Components



- The output of the detector is a data array with one or more subset.
- Each subset contains the information of one field component.
- By changing the subset index within the view ribbon of the data array the user can toggle between the evaluated field components.

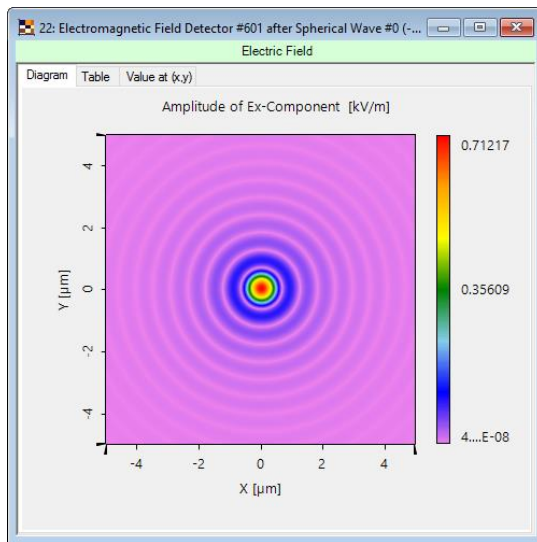
E/H Field Detector in Focus

- VirtualLab decides automatically which propagation algorithm shall be used to calculate the field within the detector plane.

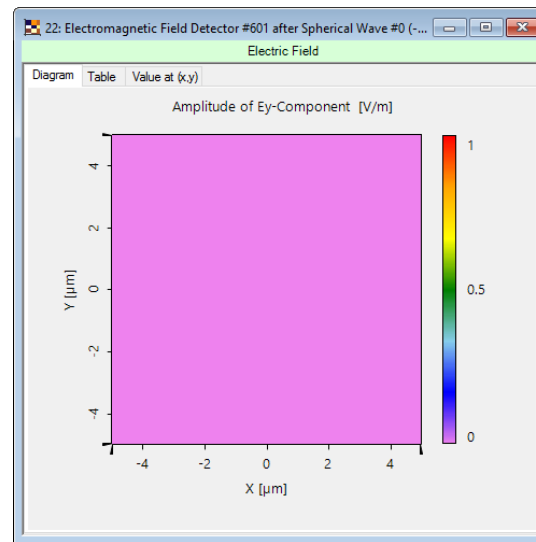


E/H Field Detector in Focus

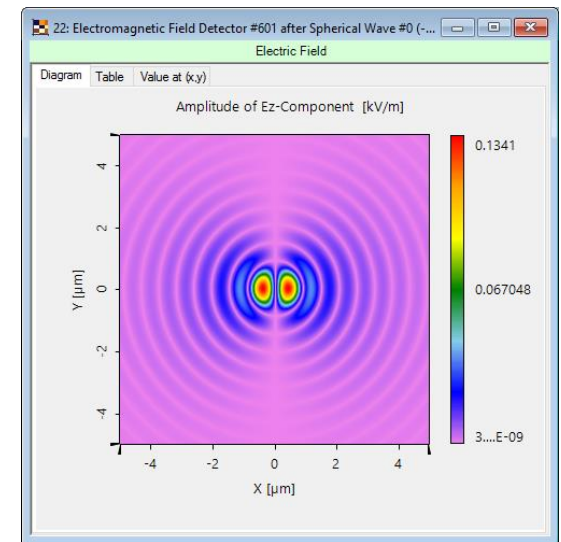
- The generated data array contains all selected field components.
- The user can switch between the field components in the view ribbon of the data array.



Amplitude of E_x



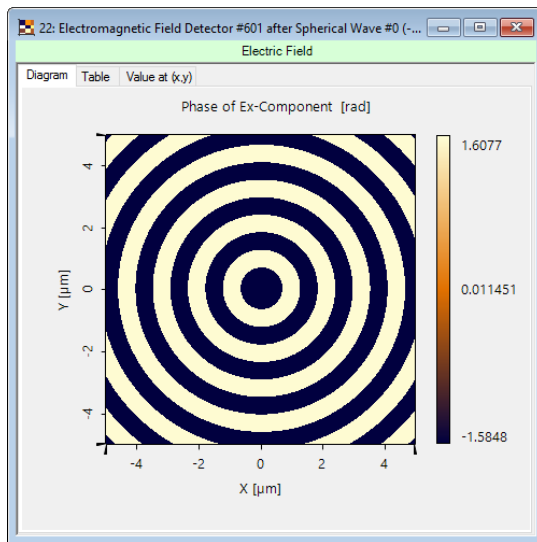
Amplitude of E_y



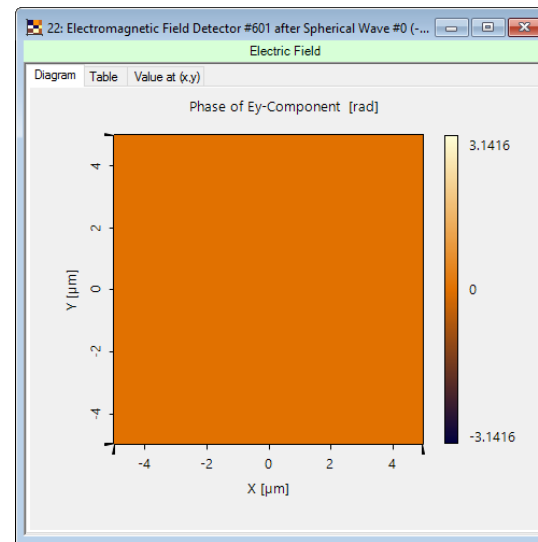
Amplitude of E_z

E/H Field Detector in Focus

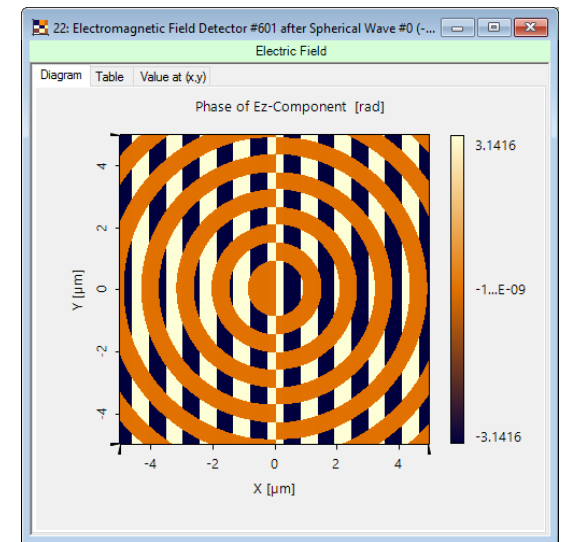
- For complex valued data array it is possible to switch between the field component.
- This can be done in the view ribbon of the data array.



Phase of E_x



Phase of E_y



Phase of E_z

Document Information

title	Electromagnetic Field Detector
version	2.0
VL version used for simulations	7.0.3.4
category	Feature Use Case
