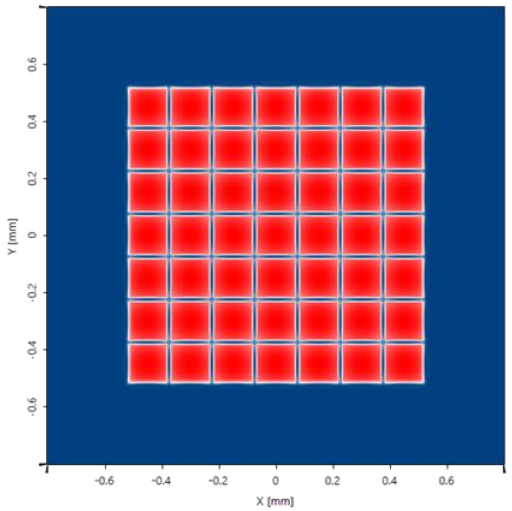
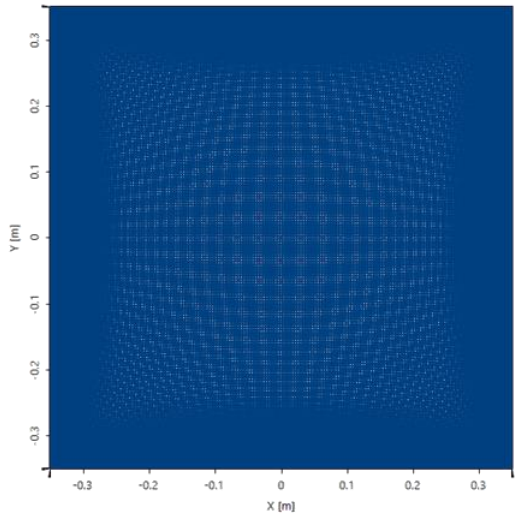
Advanced Simulation of Microlens Array with VirtualLab Fusion

Abstract



Amplitude of Ex in space domain (near field)

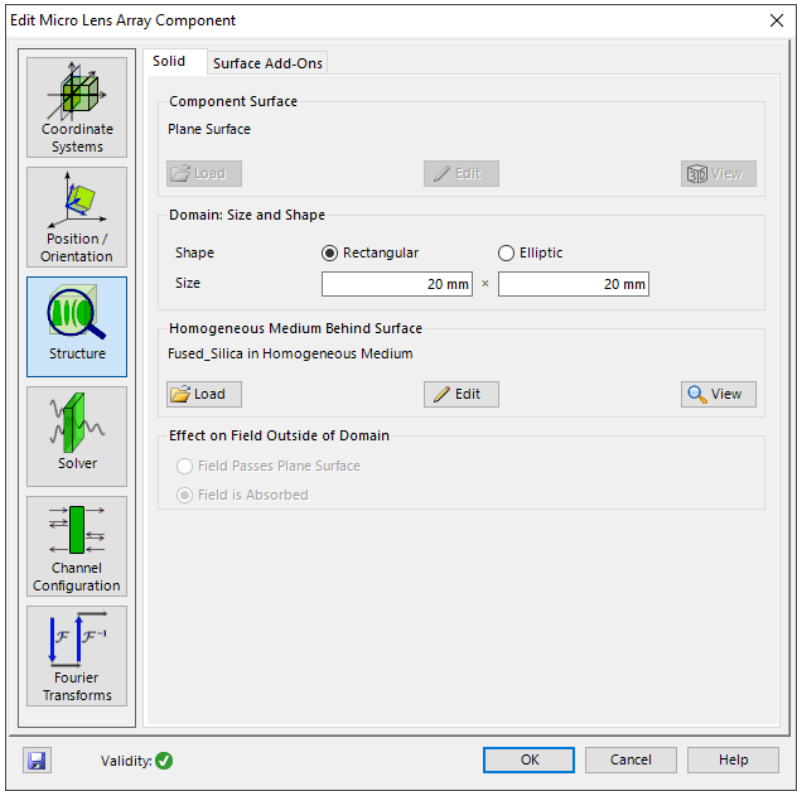


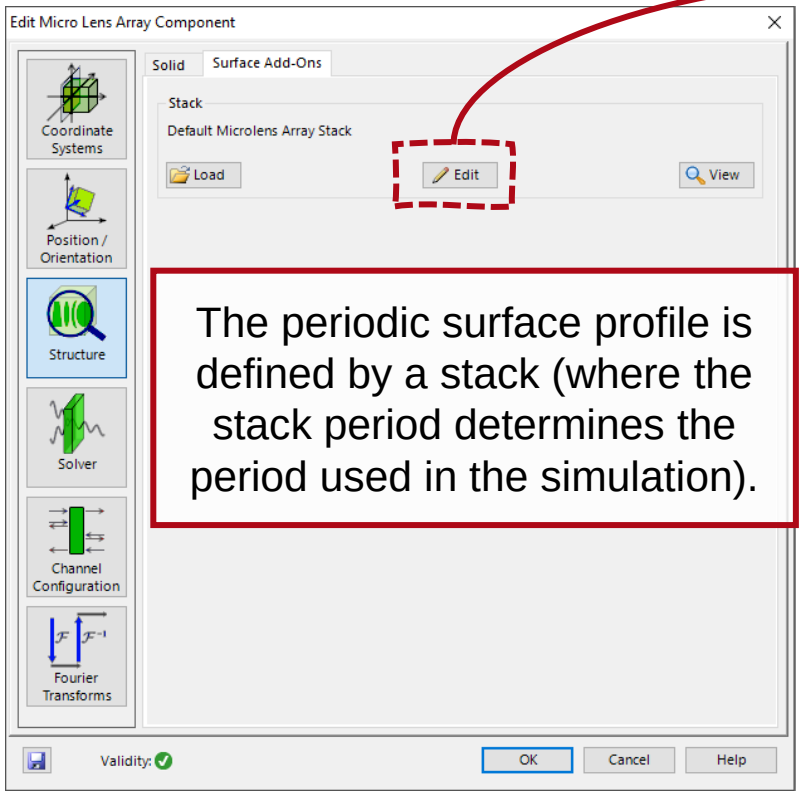
Energy density at detector plane (far field)

Microlens arrays are getting more and more attention in various optical applications, such as digital projectors, optical diffusers, and 3D imaging. VirtualLab Fusion applies an advanced field tracing algorithm to simulate this multi-channel situation. In this use case, the configuration method and usage of the Microlens Array component are introduced.

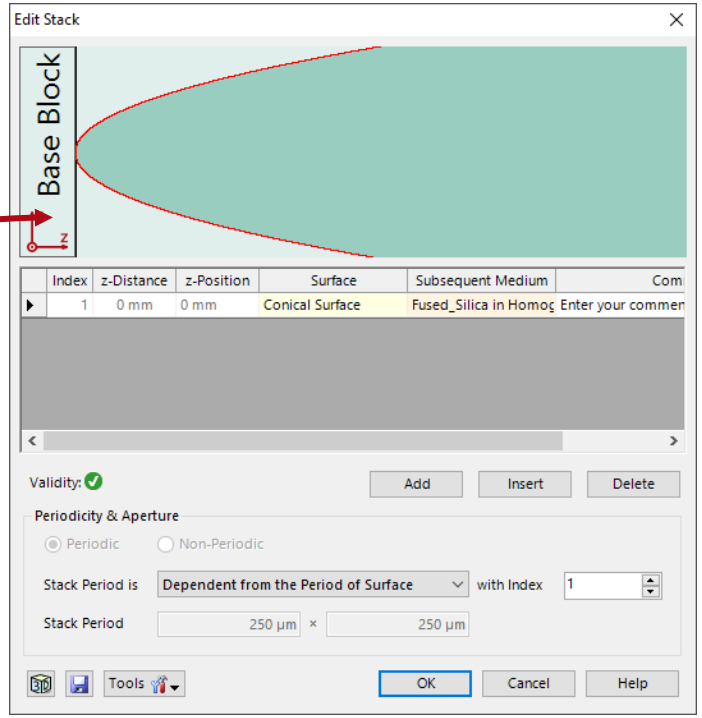
Structure Configuration of the Microlens Array

The Microlens Array component is intended as a tool to provide the possibility to define a microlens array (and other more general periodic height profiles).



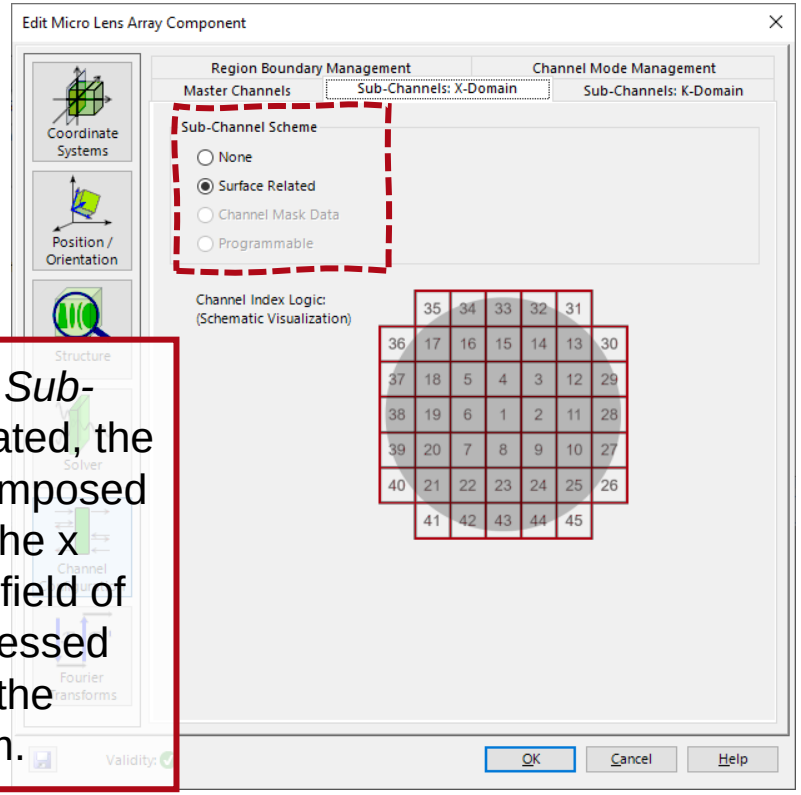


The periodic surface profile is defined by a stack (where the stack period determines the period used in the simulation).

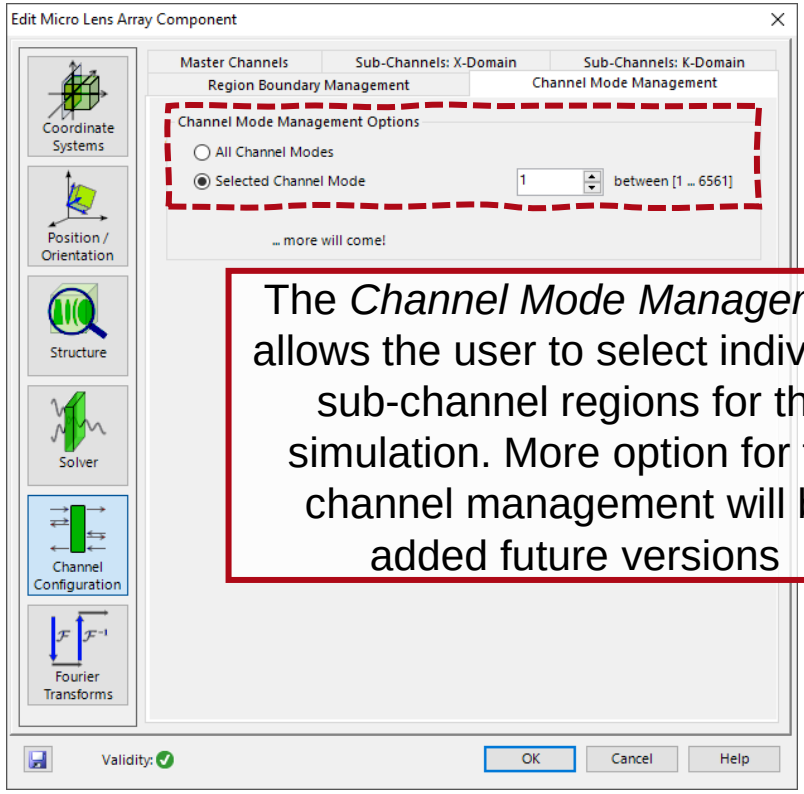


Sub-Channel Decomposition

- In the *Microlens Array* component, we enable the option to perform a lateral channel decomposition.
- The height profile per channel is modeled using the Local Plane Interface Approximation (LPIA).

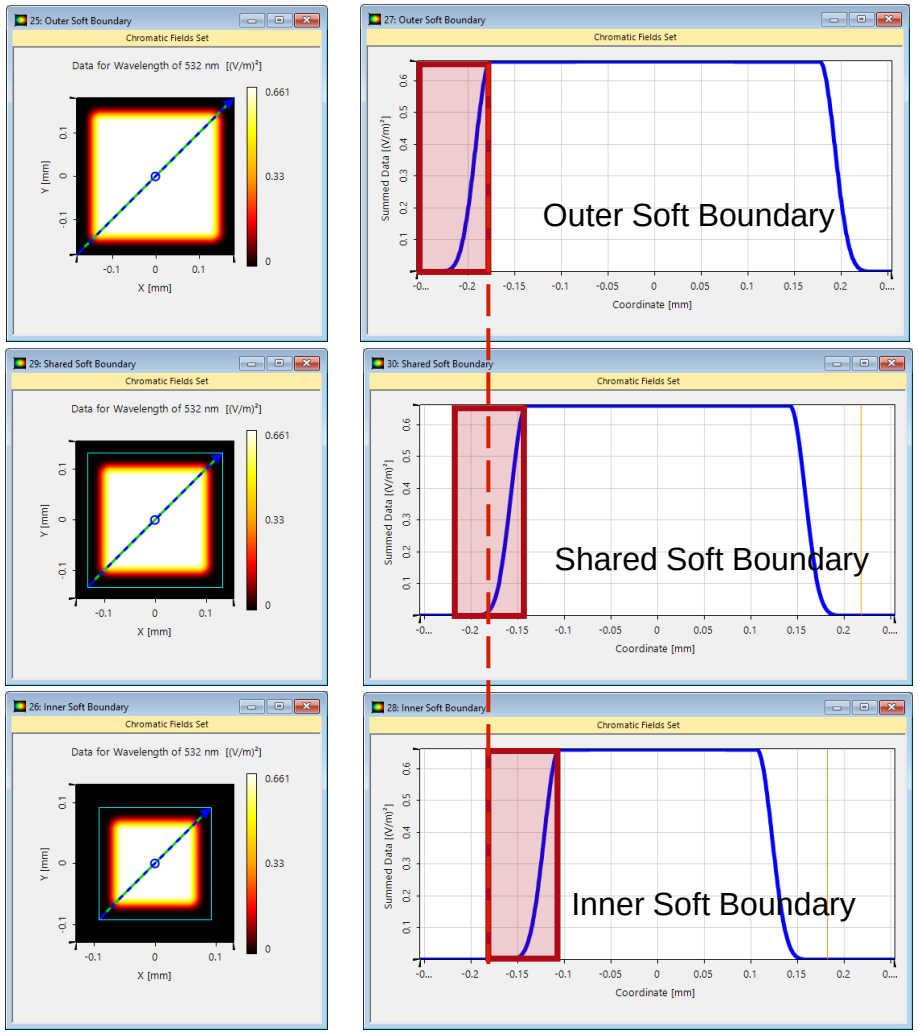


If the *Surface Related Sub-Channel Scheme* is activated, the incident light will be decomposed into sub-channels in the x domain, with the output field of each sub-channel processed individually through the subsequent system.

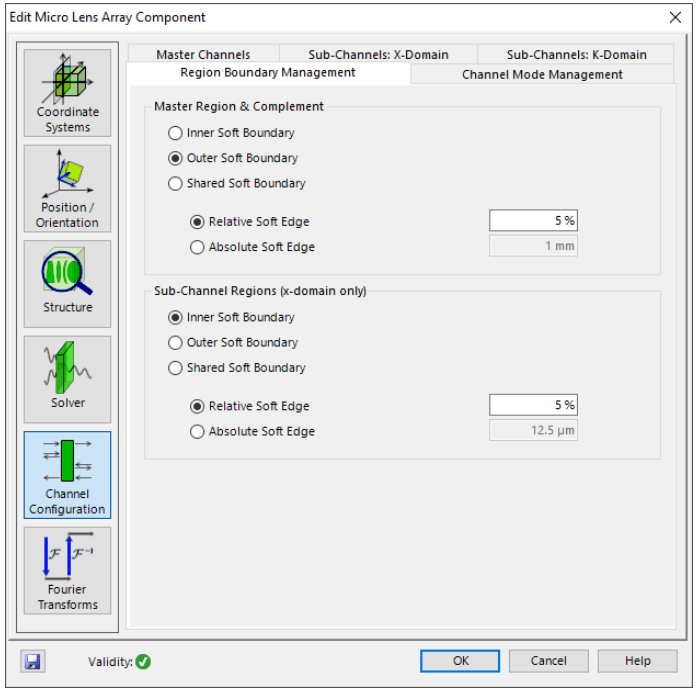


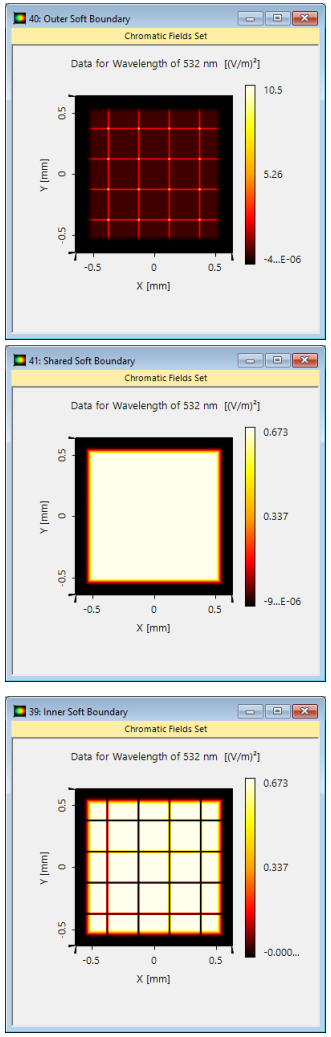
The *Channel Mode Management* allows the user to select individual sub-channel regions for the simulation. More option for the channel management will be added future versions

Region Boundary Management



- For handling the soft edge per channel several option are available on the tab page Region Boundary Management in the channel section of the edit dialog of the Microlens Array component
- The user can select between specification of the Inner, Outer or Shared soft edge. In addition, the width of the soft edge is to be specified.

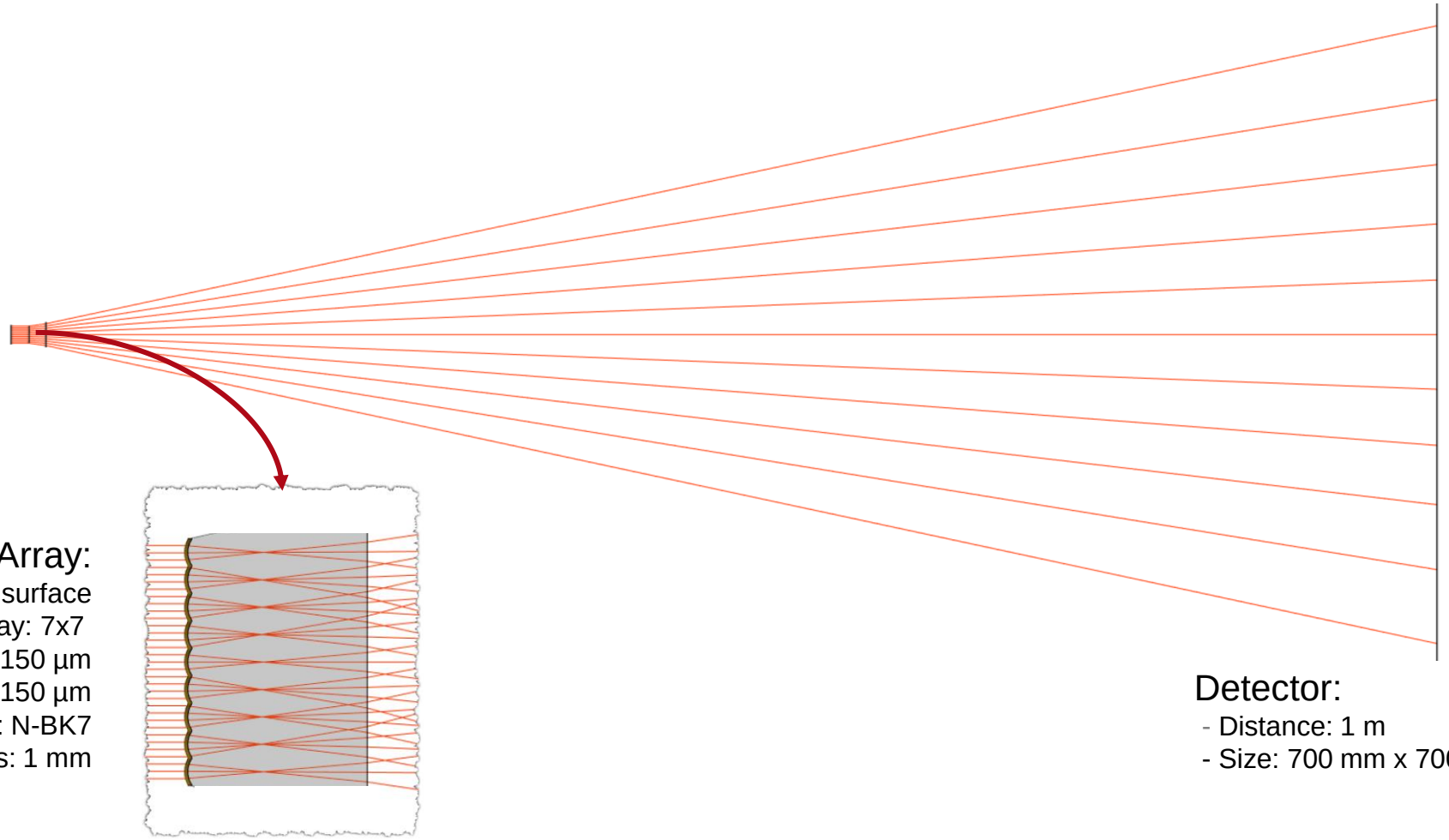




Microlens Array Scenario

Light Source:

- Plane wave
- Wavelength: 640 nm
- Linearly polarized (Ex)



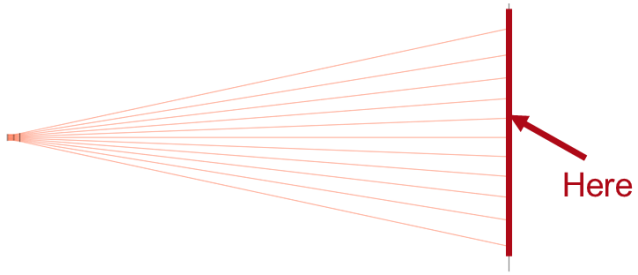
Microlens Array:

- Conical surface
- Array: 7x7
- Pitch: 150 µm x 150 µm
- Radius of curvature: 150 µm
- Substrate: N-BK7
- Thickness: 1 mm

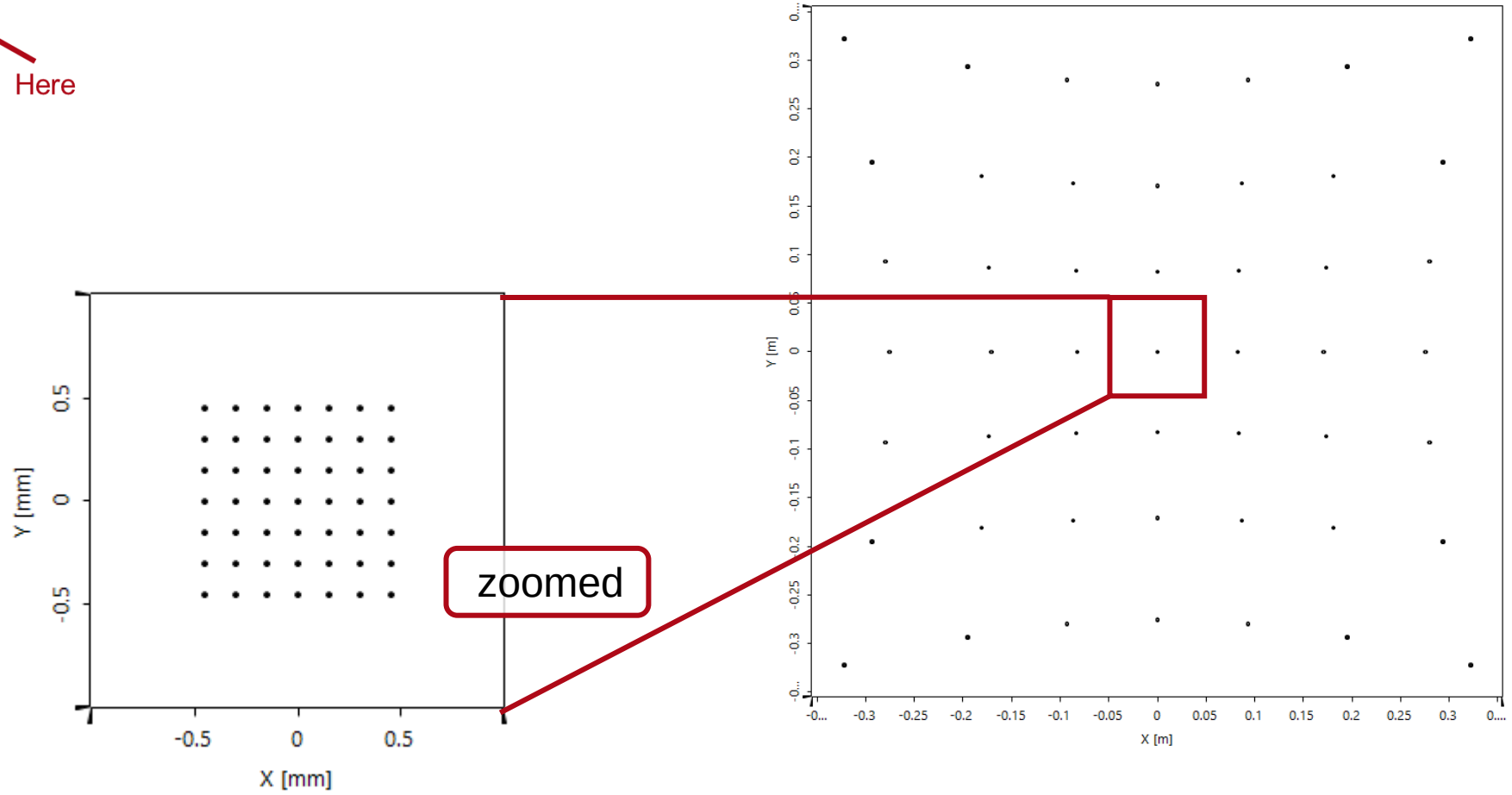
Detector:

- Distance: 1 m
- Size: 700 mm x 700 mm

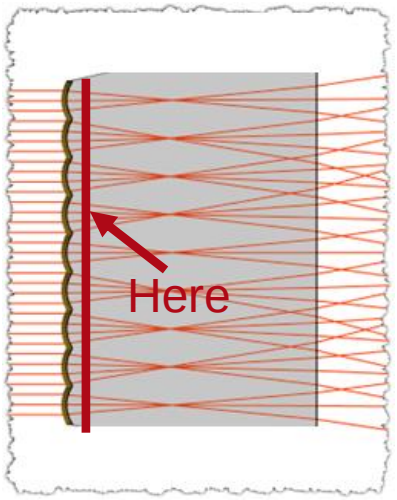
Results of Ray Tracing (Far Field)



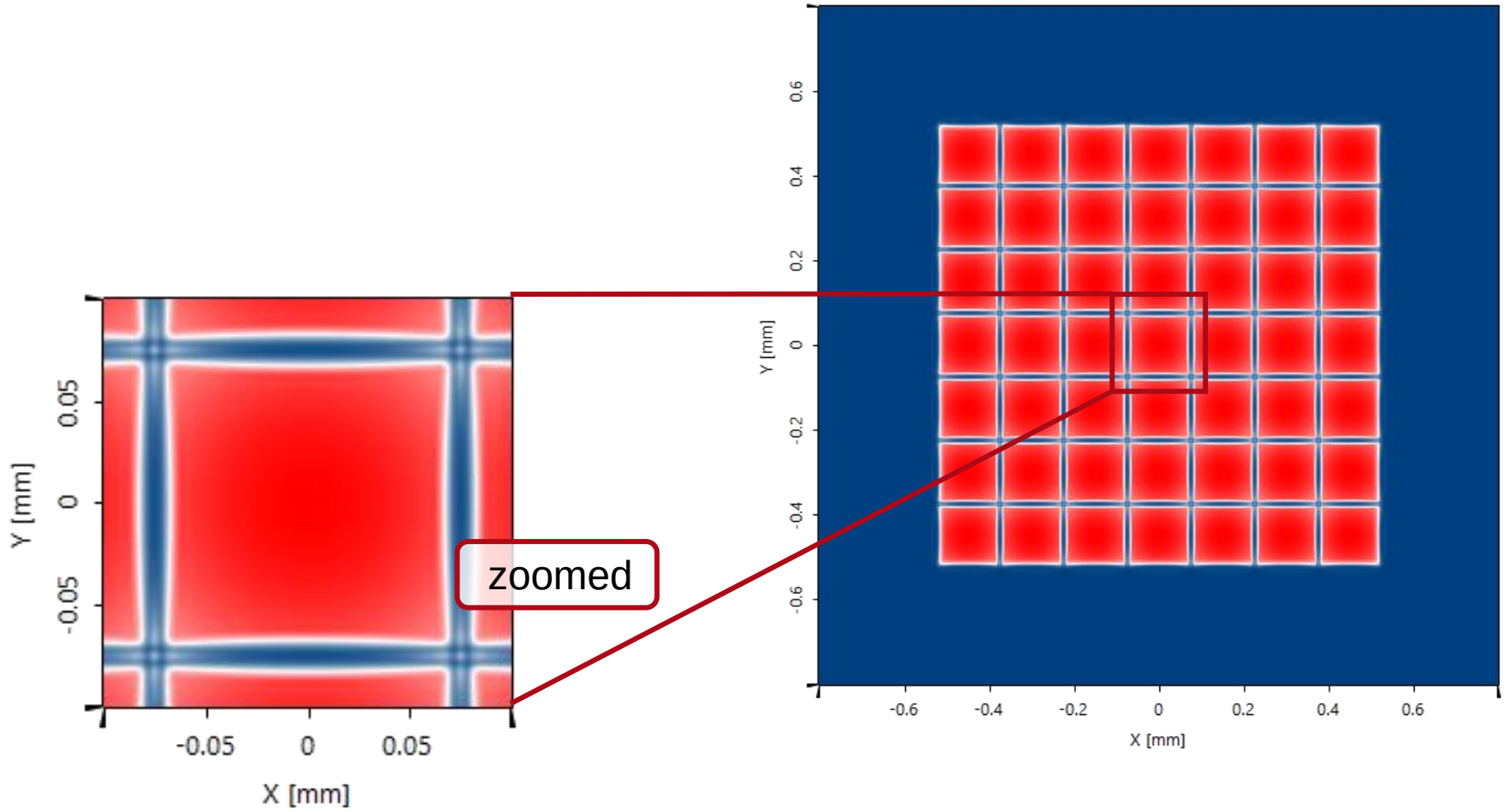
2D Ray Tracing Result:



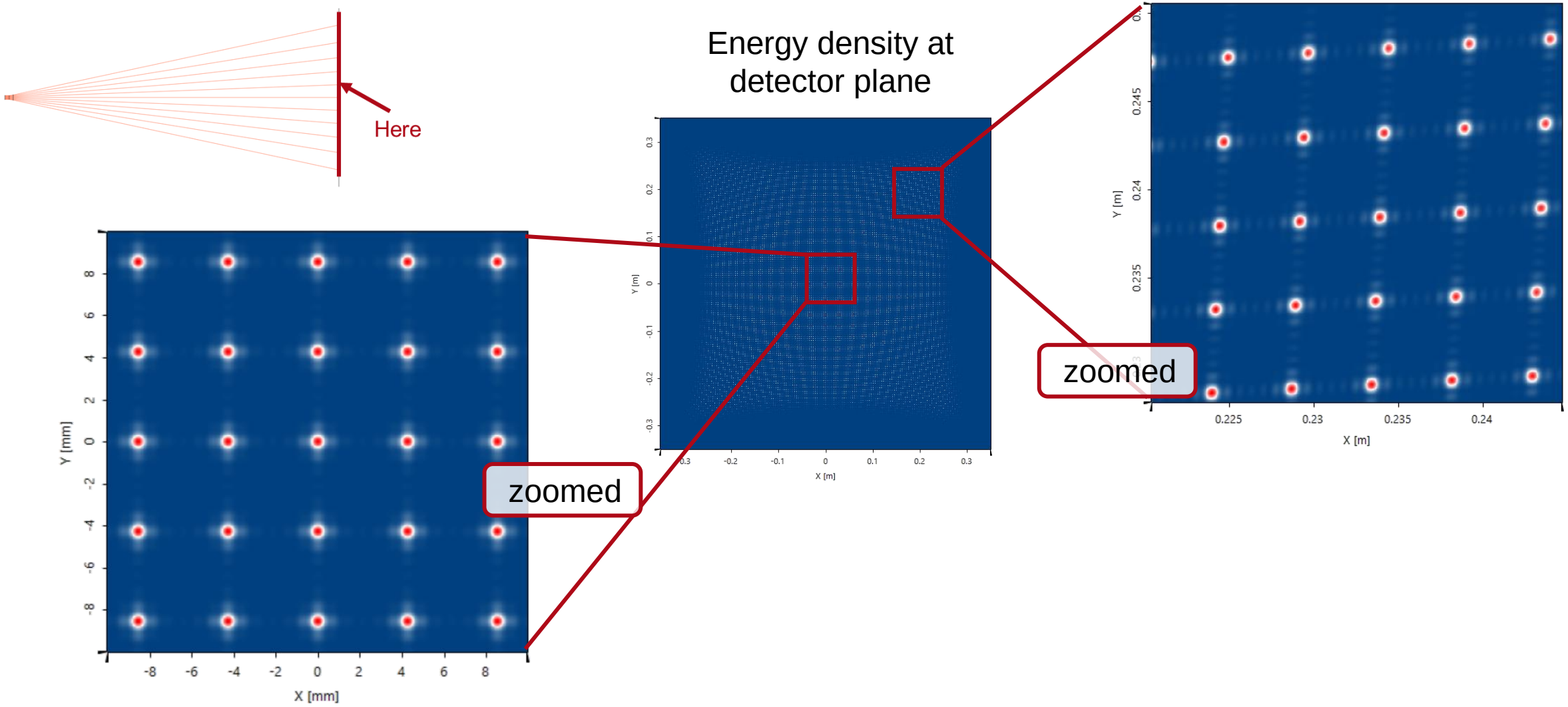
Results of Field Tracing (Near Field)



Amplitude of Ex in space domain:



Results of Field Tracing (Far Field)



Document Information

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