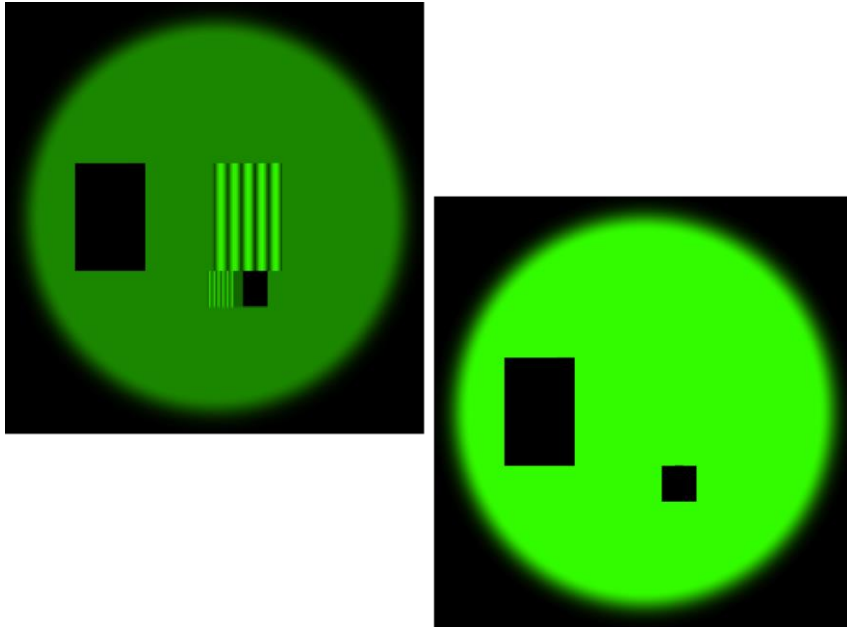


# **Channel Resolution Accuracy Setting of Non-Sequential Field Tracing**

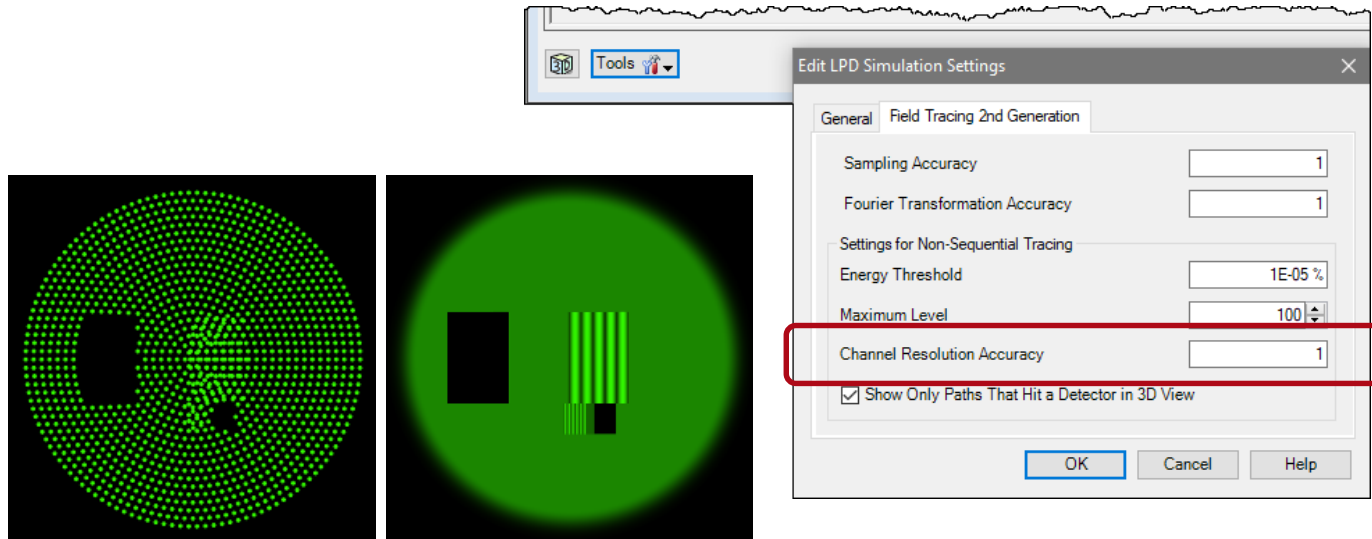
# Abstract



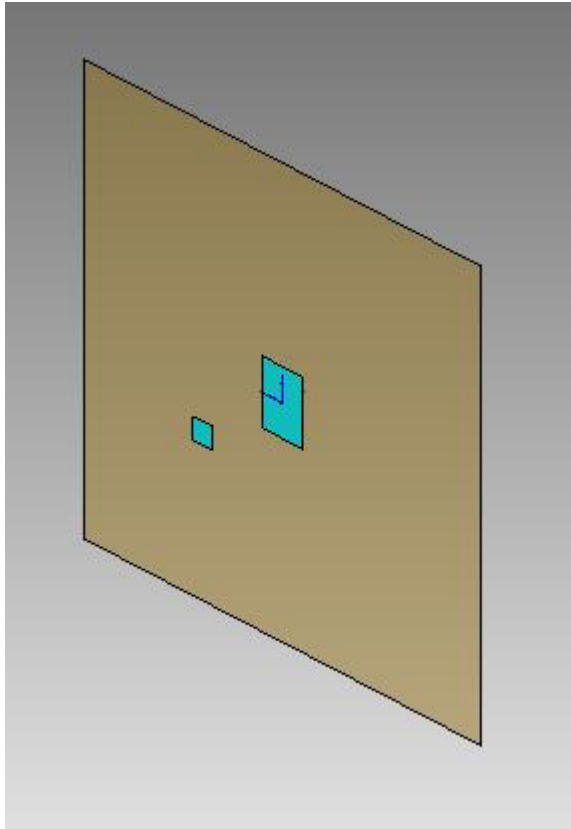
Non-sequential analysis of optical setups, especially the analysis of system with waveguides and coupling gratings, is of great importance. Non-sequential field tracing is done with two steps in VirtualLab Fusion. Firstly, according to an adjustable accuracy factor, the light path through the system is detected. Secondly, light fields are traced along these found paths. The light path detecting accuracy can be controlled by the Channel Resolution Accuracy in VirtualLab Fusion.

# Modeling Task

- how to control the channel resolution accuracy and its resulting effect of the light path.

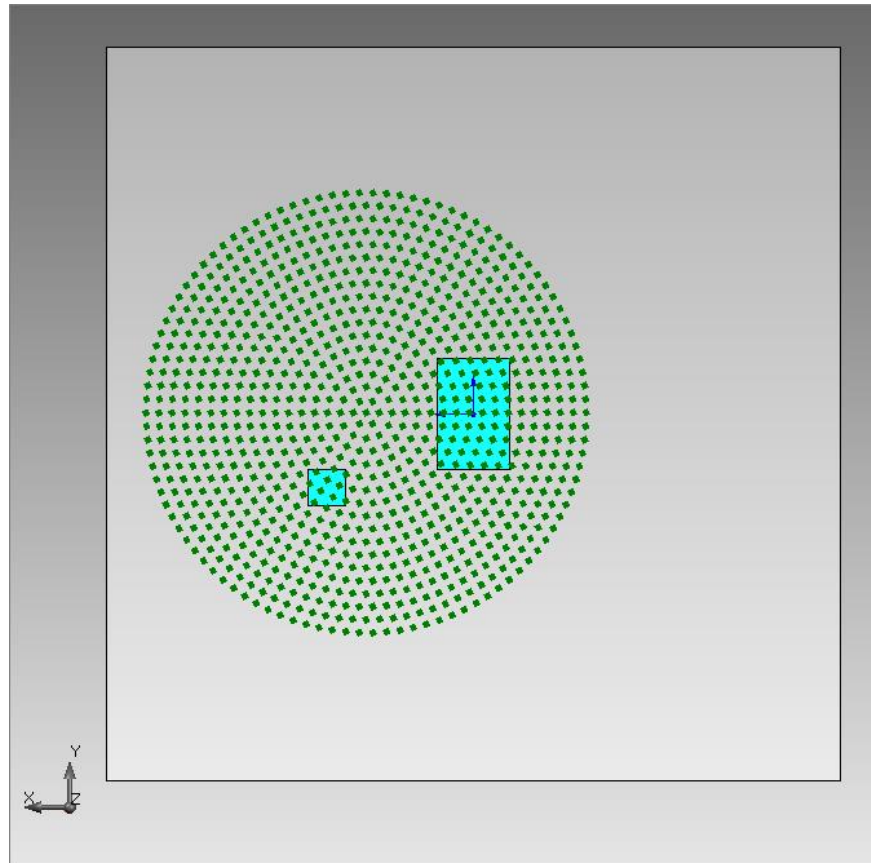


# Sample Setup



- For illustration purpose we use a plane wave which illuminates a surface on which we placed two grating regions.
- Each grating region performs a deflection of the light in different directions.

# Top View of First Side – Ray Tracing



*For clearer illustration in this document the ray color is changed.*

# Specification of Channel Resolution Accuracy

The image displays two screenshots from a software application. The left screenshot shows the 'Property Browser' for a file named '31: Feature.0039\_Channel\_Resolution\_Accuracy.lpd'. Under the 'Simulation Settings' section, the 'Global Accuracy (Field Tracing 2nd Generation)' group contains 'Sampling Accuracy' and 'Fourier Transformation Accuracy', both set to 1. The 'Non-Sequential Tracing' group contains 'Energy Threshold' (1E-05 %), 'Maximum Level' (100), 'Channel Resolution Accuracy' (1), and 'Show Only Paths That Hit a Detector in 3D View' (True). The 'Channel Resolution Accuracy' value is highlighted with a red box. The right screenshot shows the 'Edit LPD Simulation Settings' dialog box, with the 'Field Tracing 2nd Generation' tab selected. It contains the same parameters as the Property Browser, with 'Channel Resolution Accuracy' also set to 1 and highlighted with a red box. The 'Tools' button in the top toolbar is also highlighted with a red box.

Property	Value
Enable Process Logging	True
Use Parameter Coupling	False
Air Pressure	101.33 kPa
System Temperature	20 °C
Sampling Accuracy	1
Fourier Transformation Accuracy	1
Energy Threshold	1E-05 %
Maximum Level	100
Channel Resolution Accuracy	1
Show Only Paths That Hit a Detector in 3D View	True

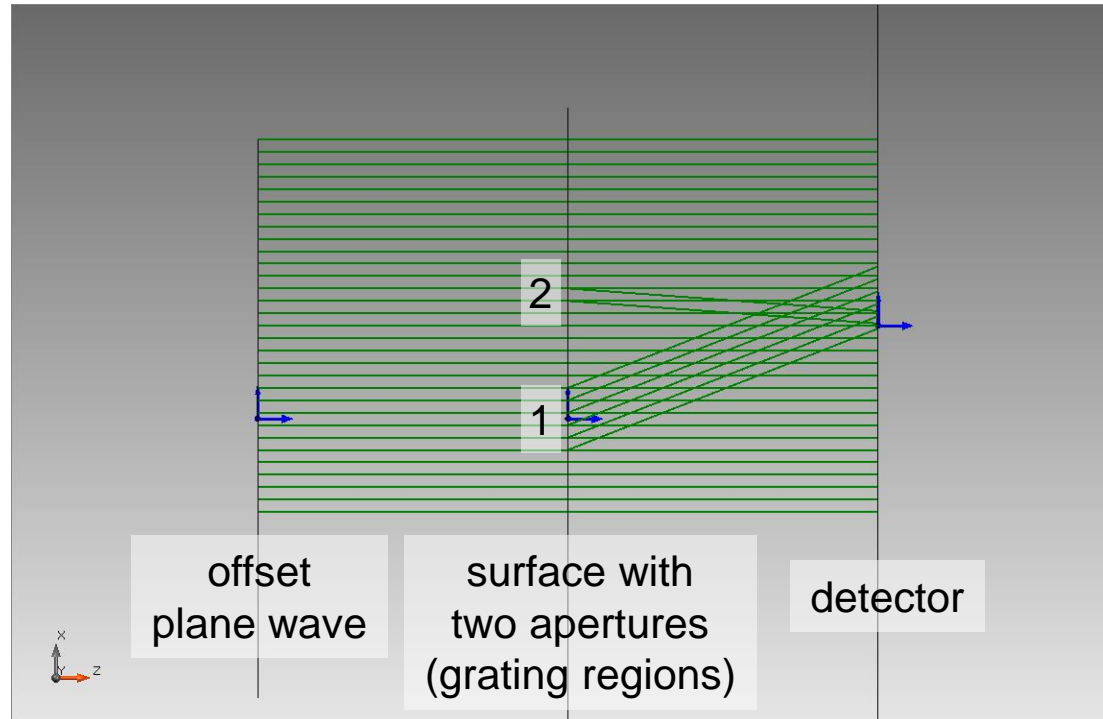
Energy Threshold  
The relative energy threshold for non-sequential tracing. Additional rays having less than this percentage of the incoming energy are ignored.

Parameter Overview Tree | **Property Browser** | VirtualLab Explorer

OK Cancel Help

- The accuracy with which the apertures on surfaces are found is specified by the channel resolution accuracy (default =1)
- either via tools button of the optical system
  - or via property browser.

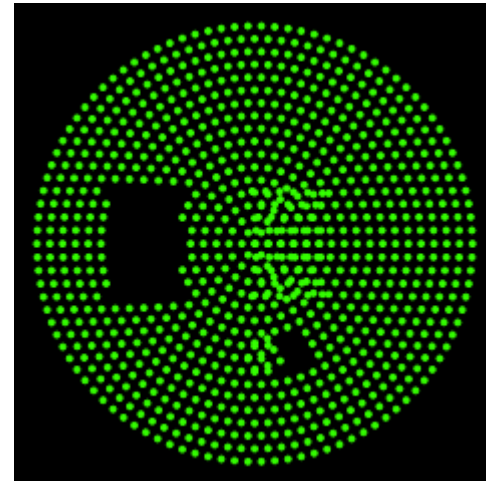
# Simulation Result – Accuracy Factor 1



With an accuracy factor of 1 above light paths are found (1 & 2).

# Simulation Result – Accuracy Factor 1

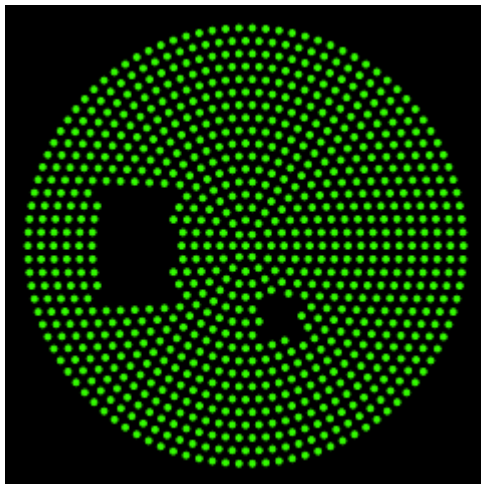
- By performing ray tracing VirtualLab calculates the corresponding information within the detector.
- In our case the detector sees three coherent modes (see also next slide).



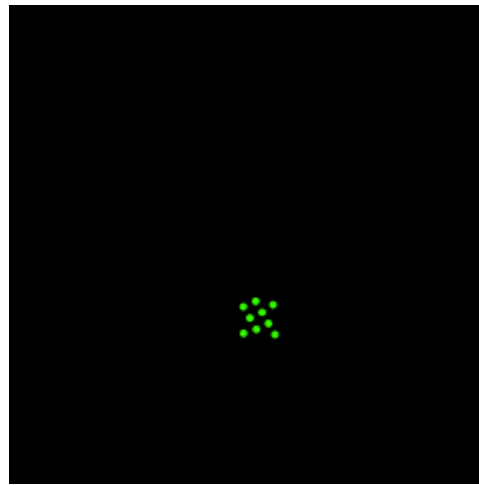


# Simulation Result – Accuracy Factor 1

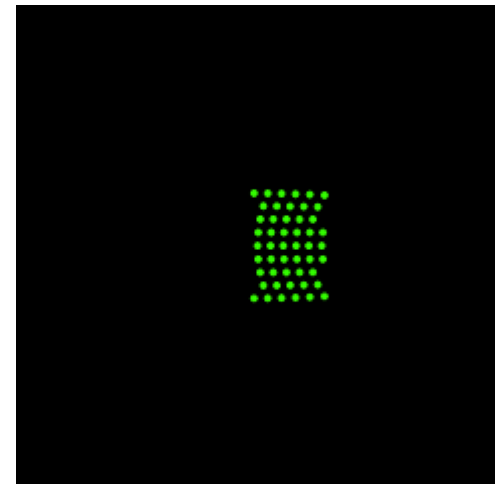
The different modes can be viewed separately in the dot diagram.



mode #1



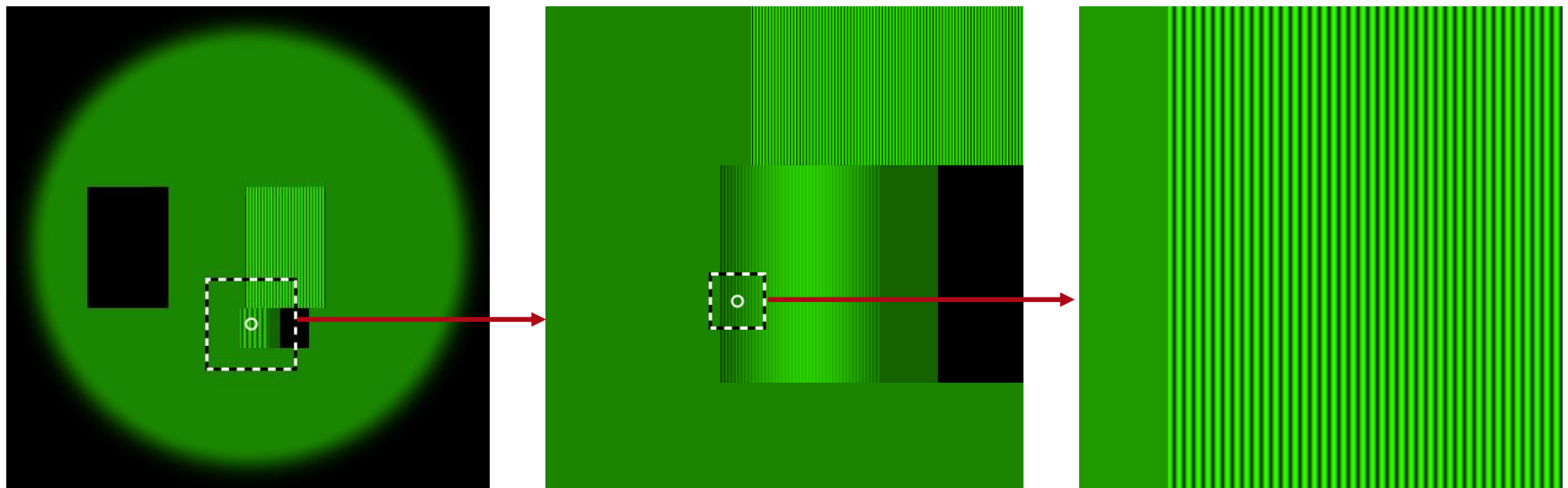
mode #2



mode #3

# Simulation Result – Accuracy Factor 1

By performing field tracing 2<sup>nd</sup> generation VirtualLab calculates the corresponding information within the detector. The camera detector can be used to evaluate the energy density in the detector plane.

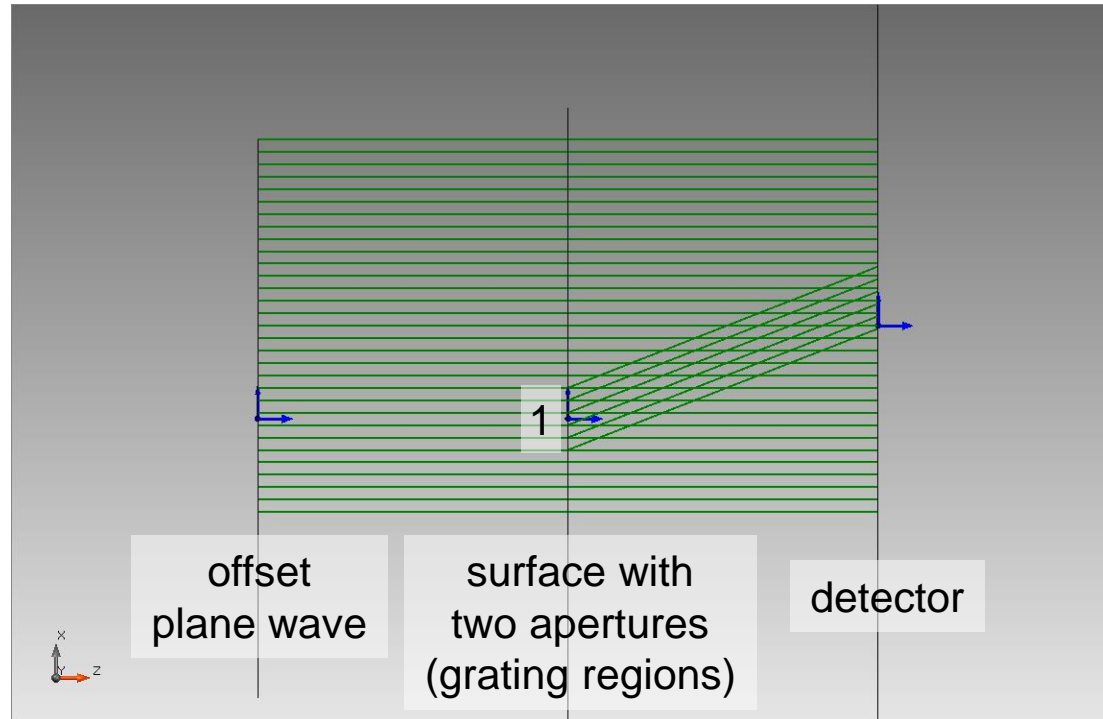


intensity distribution –  
full picture

intensity distribution –  
zoomed

intensity distribution –  
zoomed further

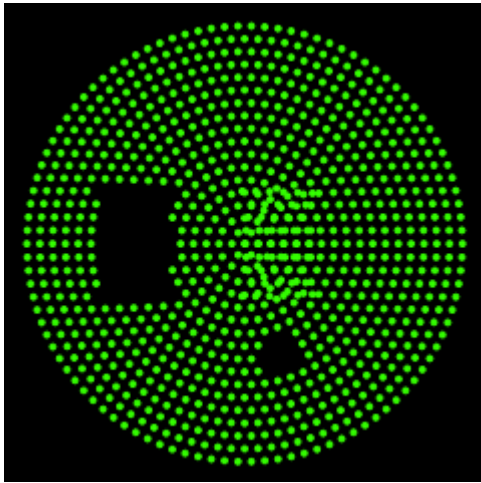
# Simulation Result – Accuracy Factor 0.5



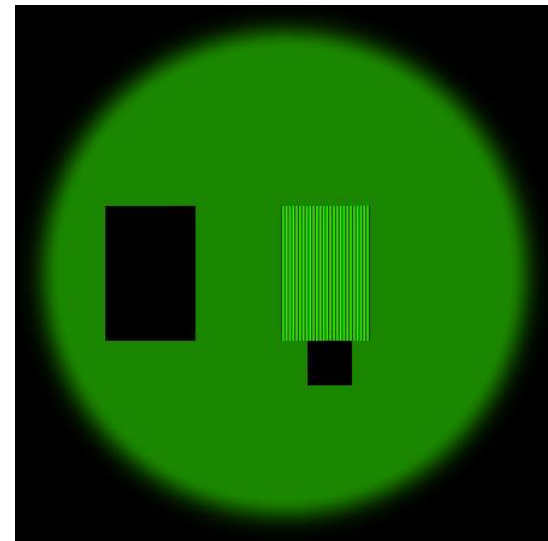
By setting the Channel Resolution Factor to 0.5 only the larger region is recognized by the light path finder.

# Simulation Result – Accuracy Factor 0.5

Again by performing ray tracing or field tracing VirtualLab calculates the corresponding information within the detector plane.

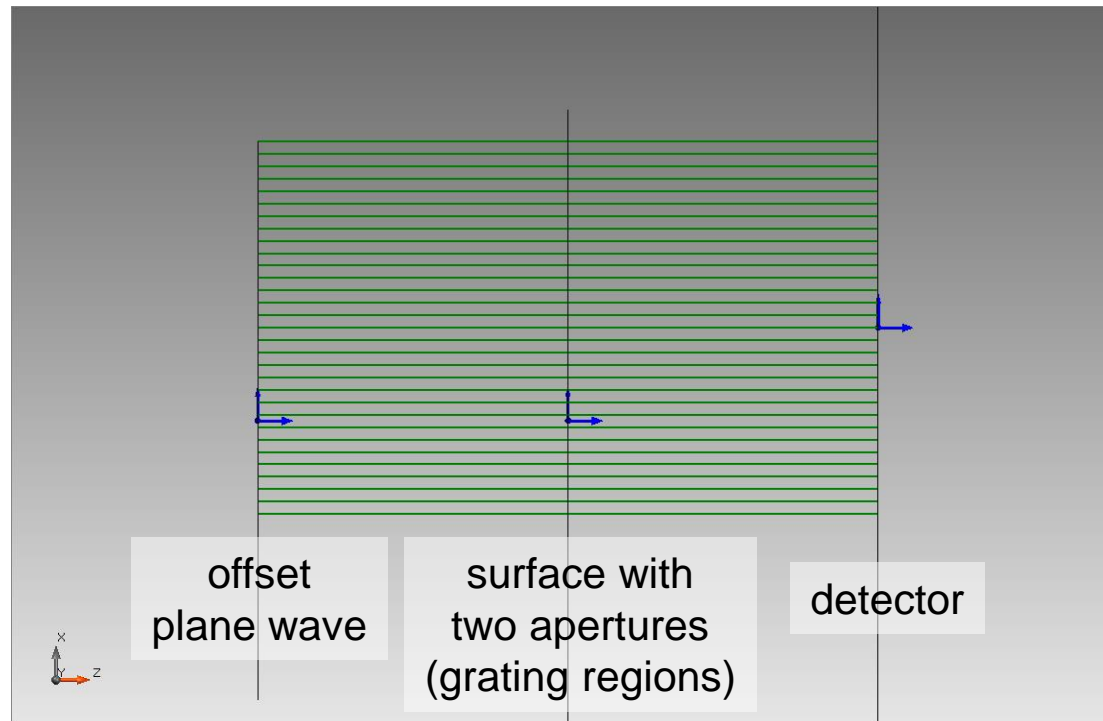


dot diagram  
(2 coherent modes)



intensity distribution  
(including interference)

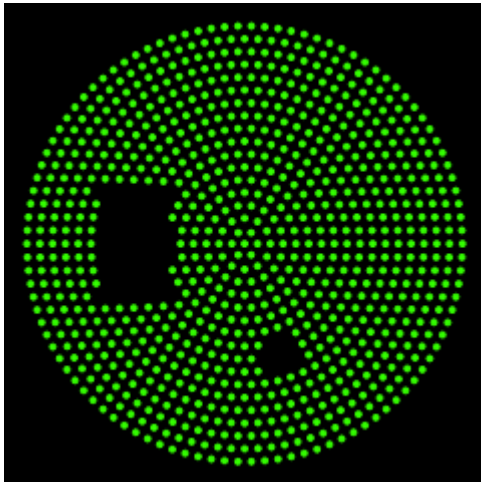
# Simulation Result – Accuracy Factor 0.2



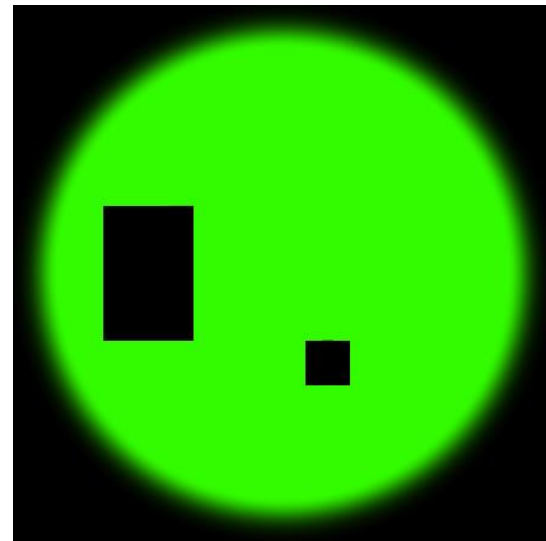
By setting the channel resolution factor to 0.2 no grating region are resolved by the lightpath finder. Only the intersection with the surface is taken into account.

# Simulation Result – Accuracy Factor 0.2

Corresponding information within the detector.



dot diagram  
(1 coherent mode)



intensity distribution  
(no interference)

# Document Information

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title	Channel Resolution Accuracy Setting of Non-Sequential Field Tracing
version	1.0
VL version used for simulations	7.0.3.4
category	Feature Use Case

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