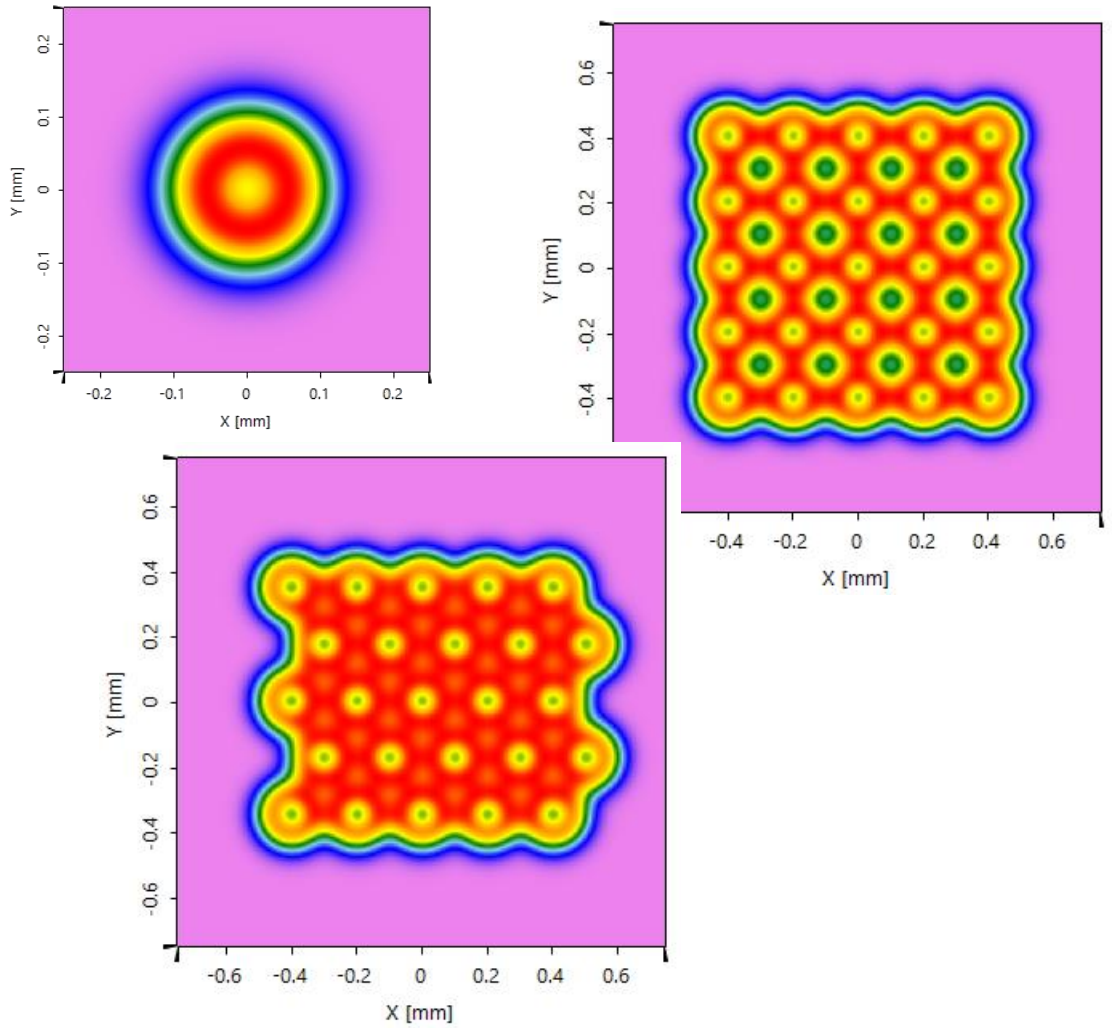
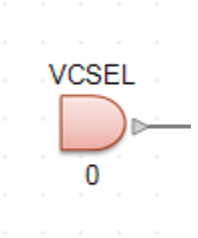
Modeling of an Array of Vertical Cavity Surface Emitting Laser (VCSEL) Diodes

Abstract



Arrays of Vertical cavity surface emitting laser (VCSEL) diodes are of interest for various applications, e.g. beam splitters and pattern generators. In order to be able to investigate optical systems with this kind of light source in VirtualLab an appropriate source model is required. In this document it is shown, how a VCSEL array source can be modeled in VirtualLab Fusion.

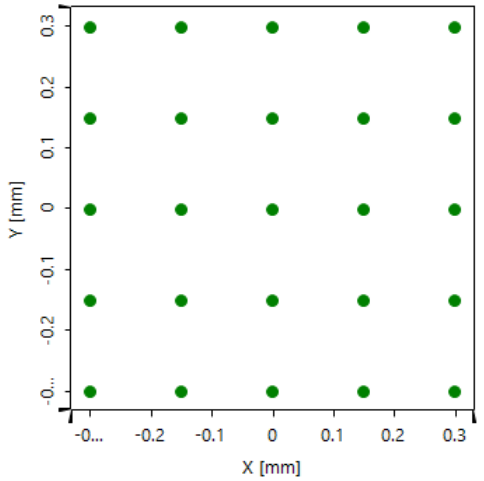
Modeling Task: VCSEL Array with different Types of Grid



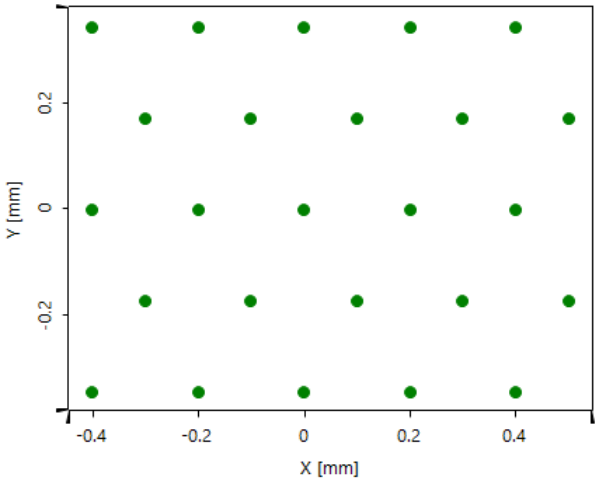
array of VCSEL diodes

central wavelength: 940 nm
half-angle divergence: 11°
number of VCSELs: 5×5

a) rectangular pattern
b) hexagonal pattern



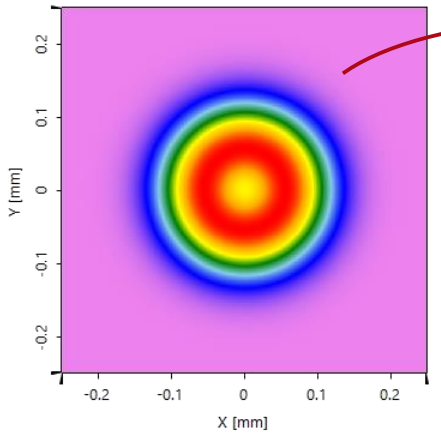
rectangular grid

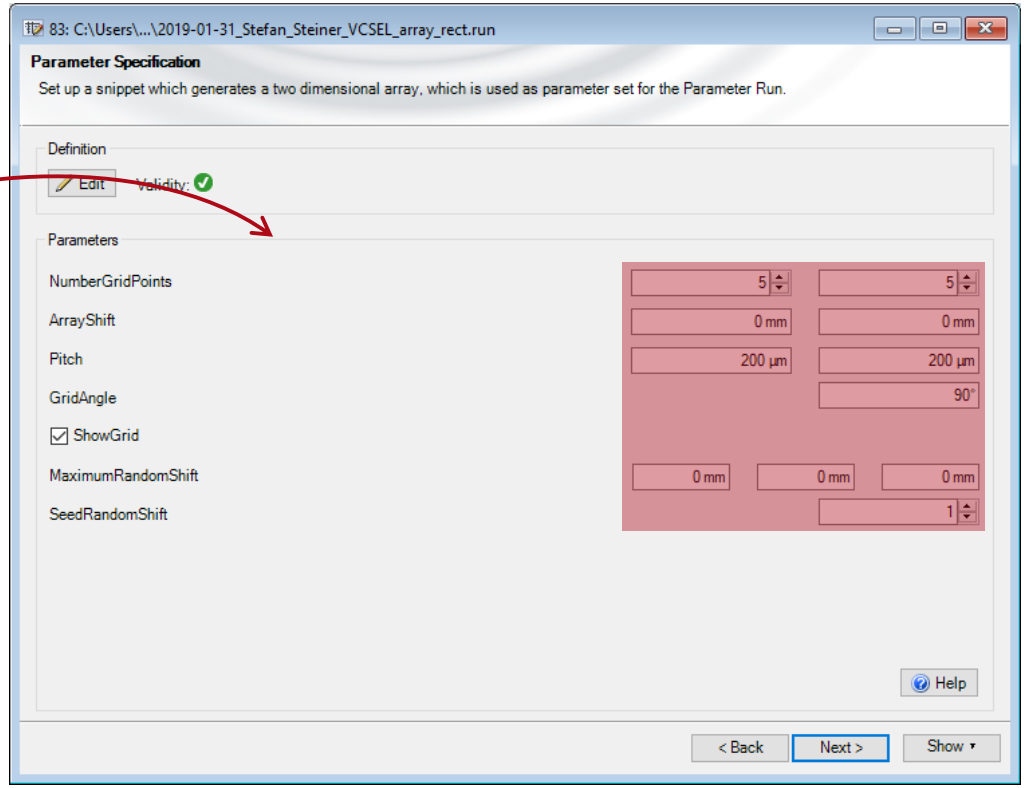


hexagonal grid

Simulation of a VCSEL Array by using a single VCSEL

intensity distribution of a single VCSEL

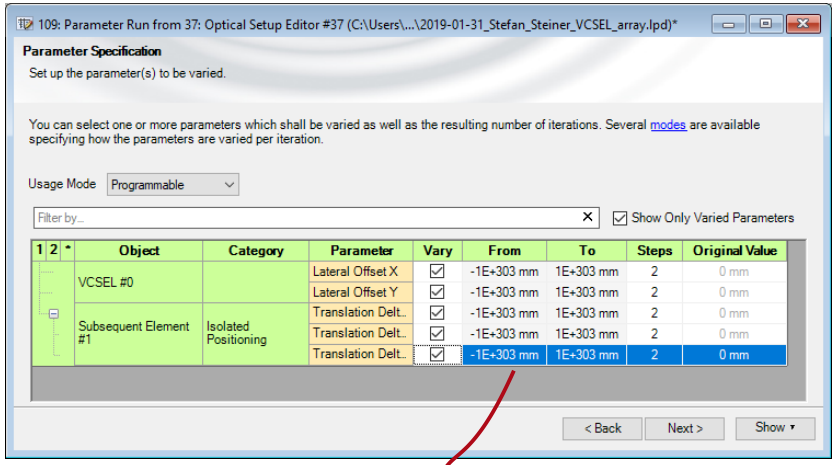


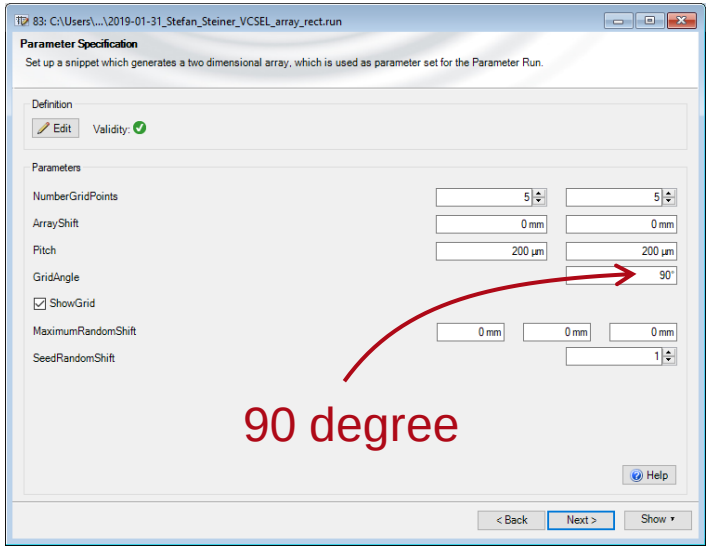


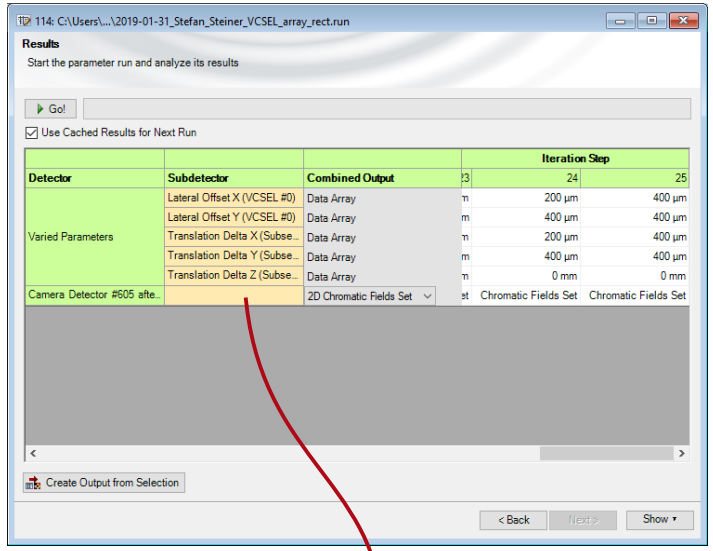
A programmable Parameter Run is used to model the whole array by automatically generating the desired array grid

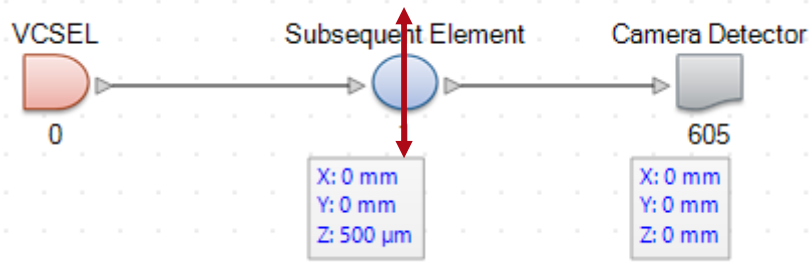
Parameter	Description
NumberGridPoints	defines the number of VCSELs in the array
ArrayShift	enables a shift of the whole array by x and y
Pitch	pitch of the array according to x and y
GridAngle	sets the angle inside the array
ShowGrid	provides an output of a preview of the VCSEL positions in the array
Max.RandomShift	enables a randomly distributed shift of the positions inside the array
SeedRandomShift	Sets the seed for the random shift

Simulation of a VCSEL Array with Rectangular Grid

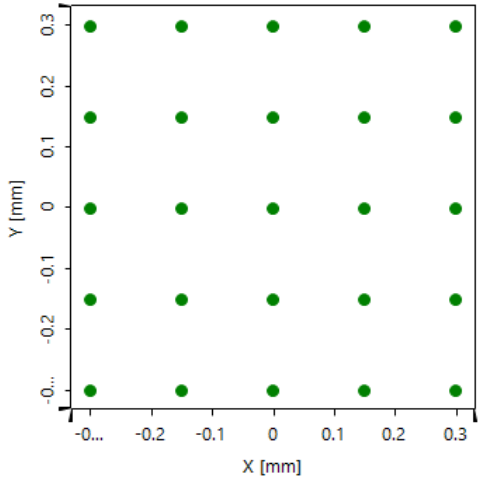


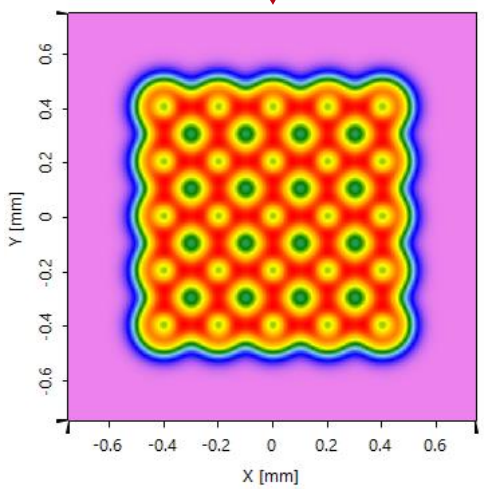






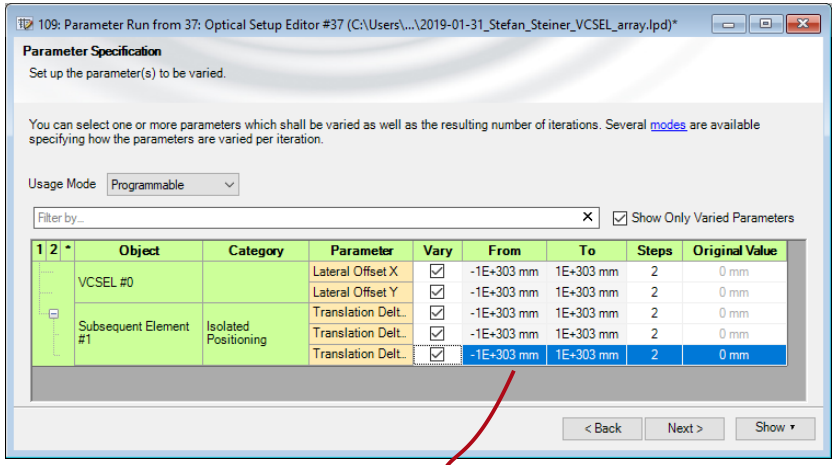
preview of the defined grid

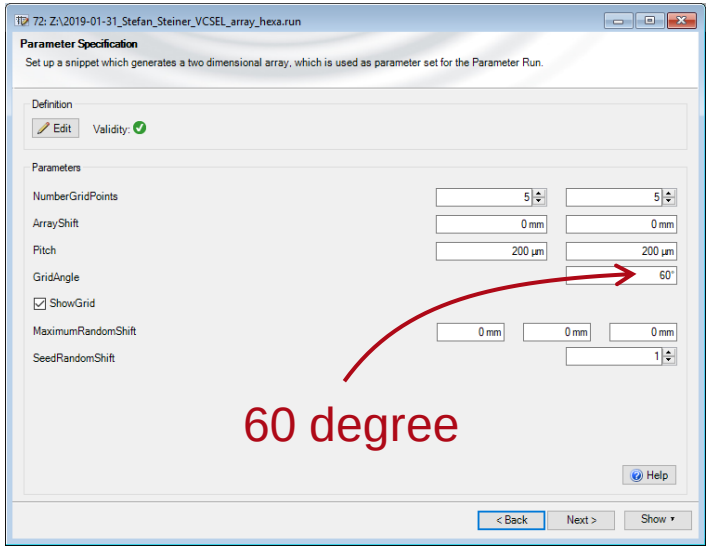


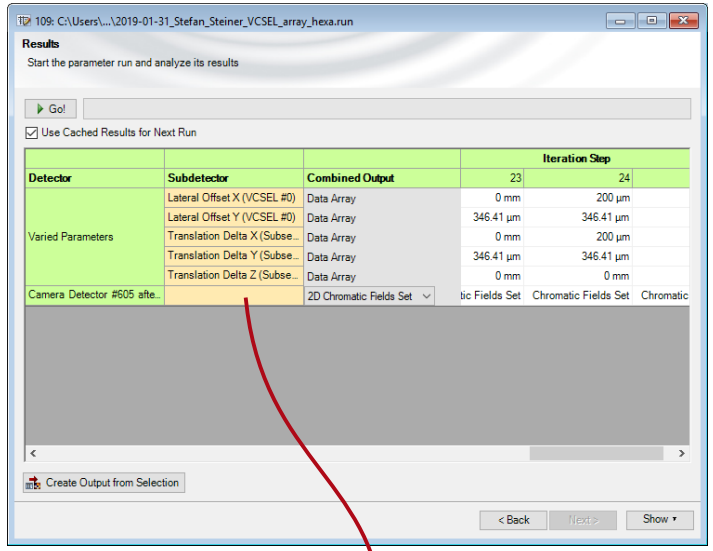


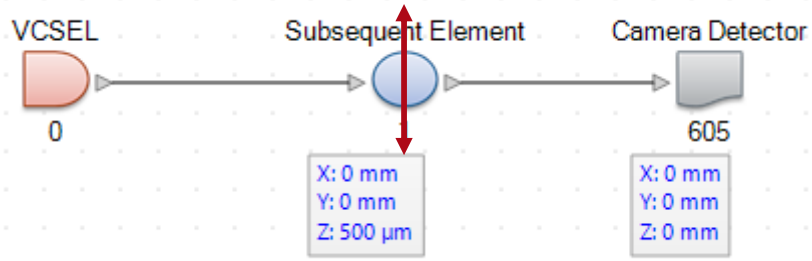
The Parameter Run basically varies the positions of single VSCEL and the subsequent element.

Simulation of a VCSEL Array with Hexagonal Grid

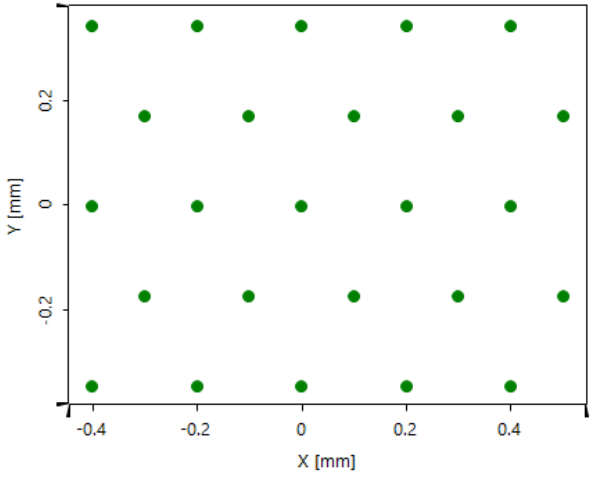


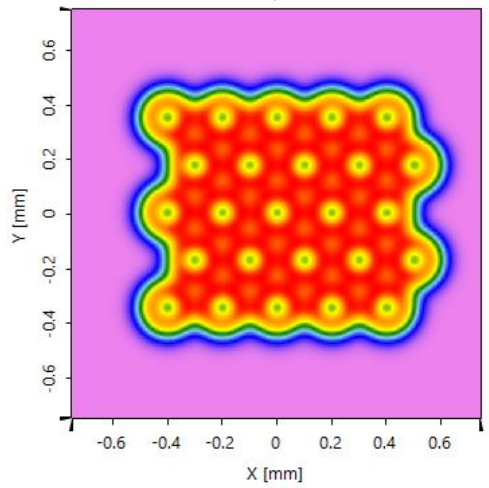






preview of the defined grid



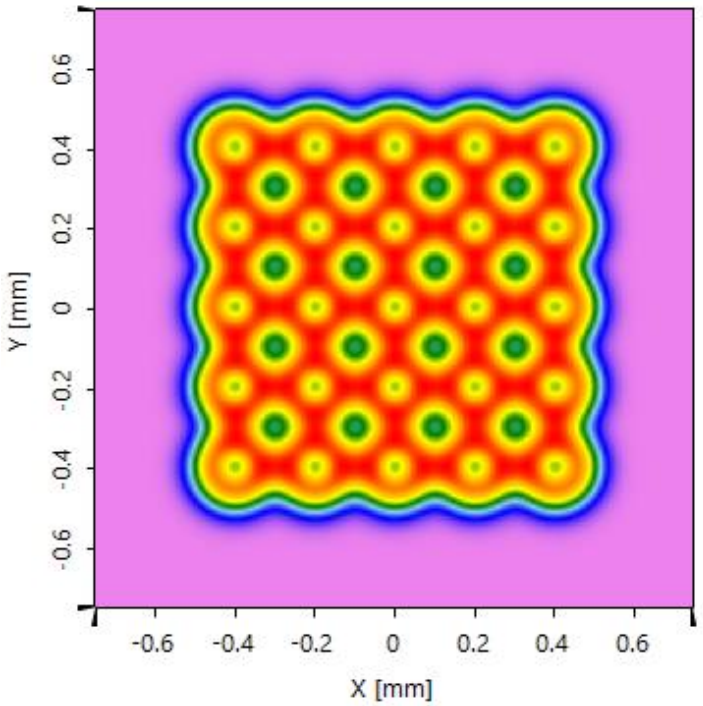


The Parameter Run basically varies the positions of single VSCEL and the subsequent element.

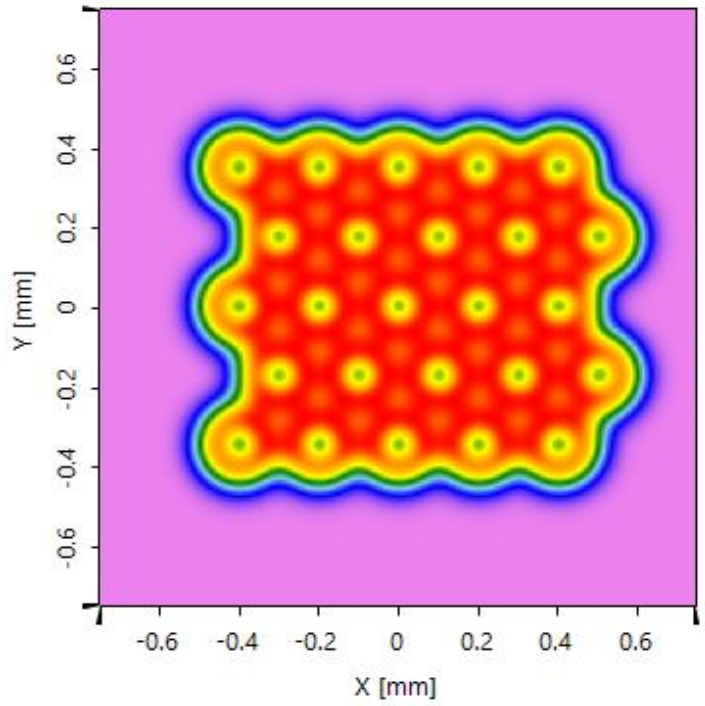
Results

Intensity distribution of a 5×5 VCSEL array

rectangular grid



hexagonal grid



Workflow in VirtualLab

- Set up input Gaussian field
  - Basic Source Models

Document Information

title	Modeling of an Array of Vertical Cavity Surface Emitting Laser (VCSEL) Diodes
document code	tba
version	0.9
toolbox(es)	Starter Toolbox
VL version used for simulations	7.4.0.49
category	Application Use Case
further reading	Modeling of a Vertical Cavity Surface Emitting Laser (VCSEL) Diode in VirtualLab Fusion