WYROWSKI PHOTONICS

UseCase.0065 (1.0)

Usage of the Parameter Run Document

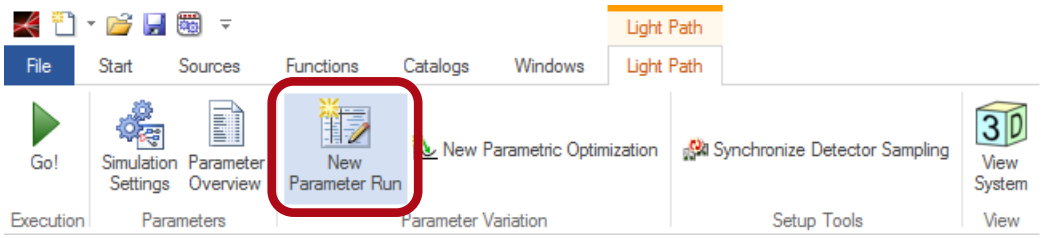
Keywords: parameter, varying, variation, change, tolerance, simulation, parallelization, combination, random, Monte Carlo, result animation

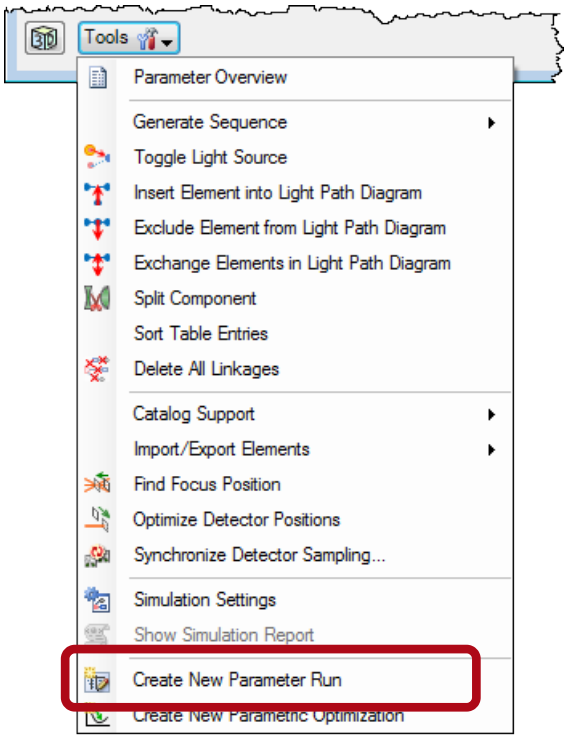
Parameter Run Document

- The *Parameter Run* document allows the variation of the numerical parameters of a Light Path Diagram.
- It can be used e. g. to investigate the system's sensitivity for parameter tolerances or to optimize parameters.
- One or multiple parameters can be varied.
- Detector results are recorded within the Parameter Run Document.
- A copy of the original Light Path Diagram is stored in the Parameter Run Document.

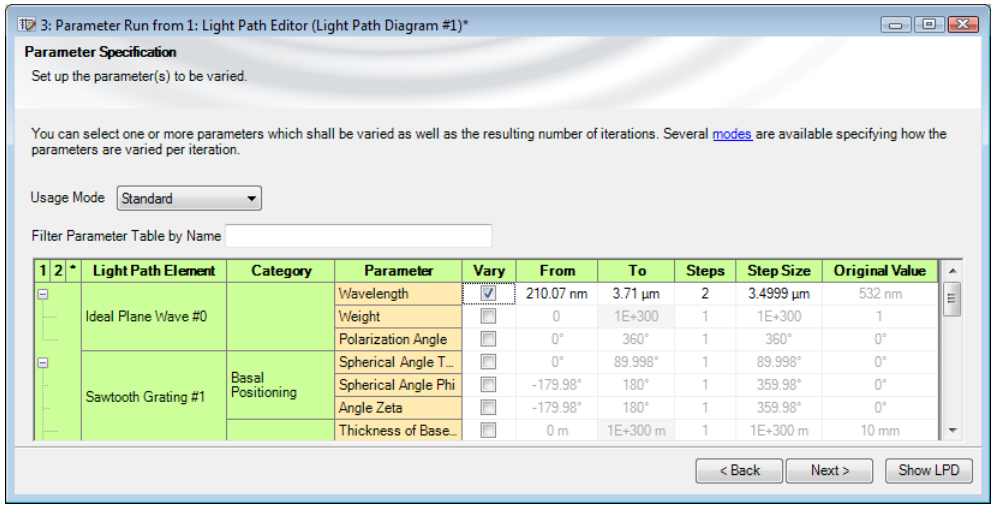
New Parameter Run

- To generate a new Parameter Run an open and activated Light Path Document window is required.
- A new Parameter Run document can be generated via
  - ribbon
  - Light Path Tools
  - shortcut Ctrl + P





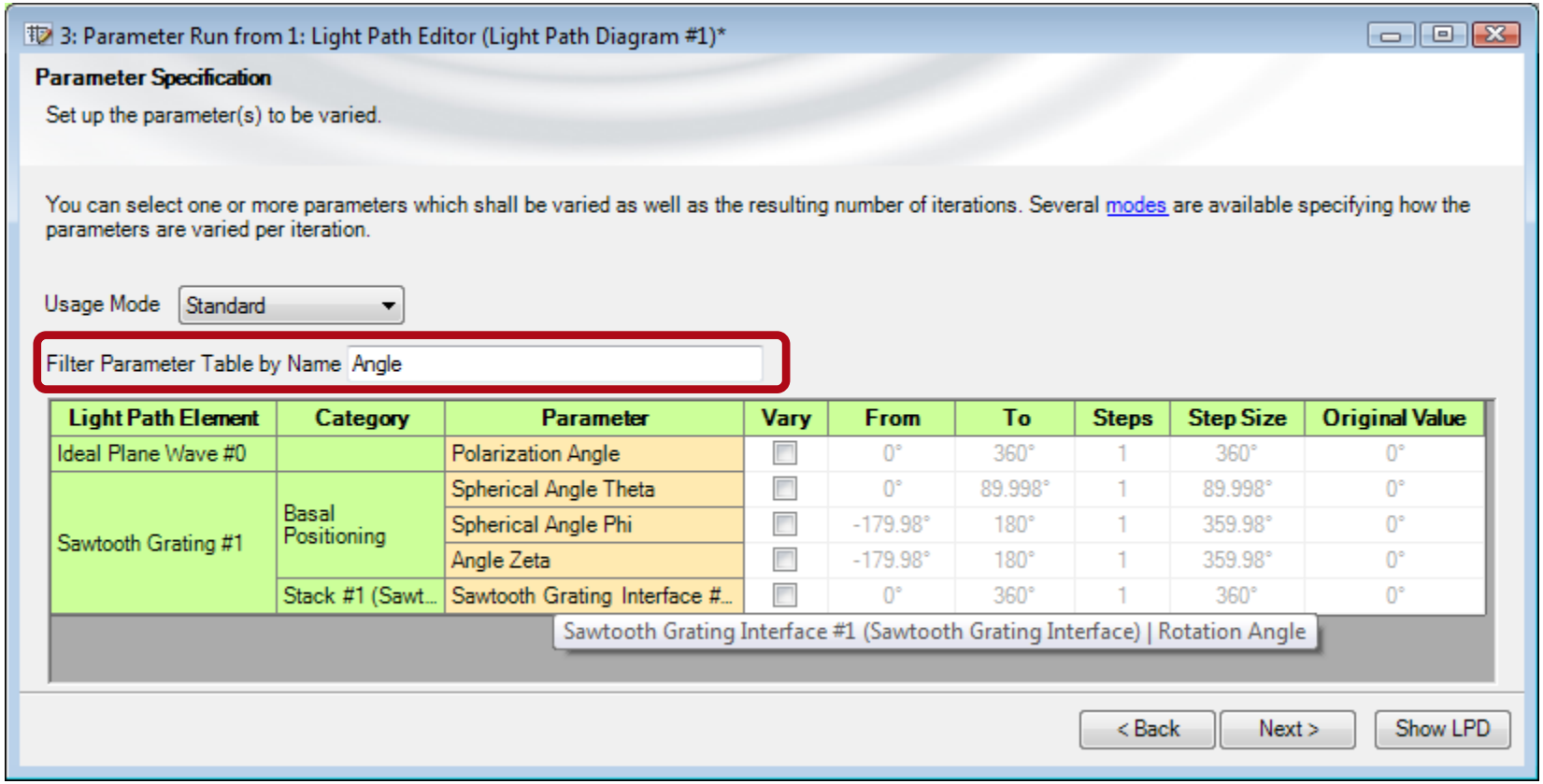
Parameter Specification Page



- This page allows you to select the parameters that should be varied.
- The parameter range and the number of steps can be specified.
- Four different *Usage Modes* (Standard, Programmable, Scanning, Random). Explained later.

Parameter Specification Page

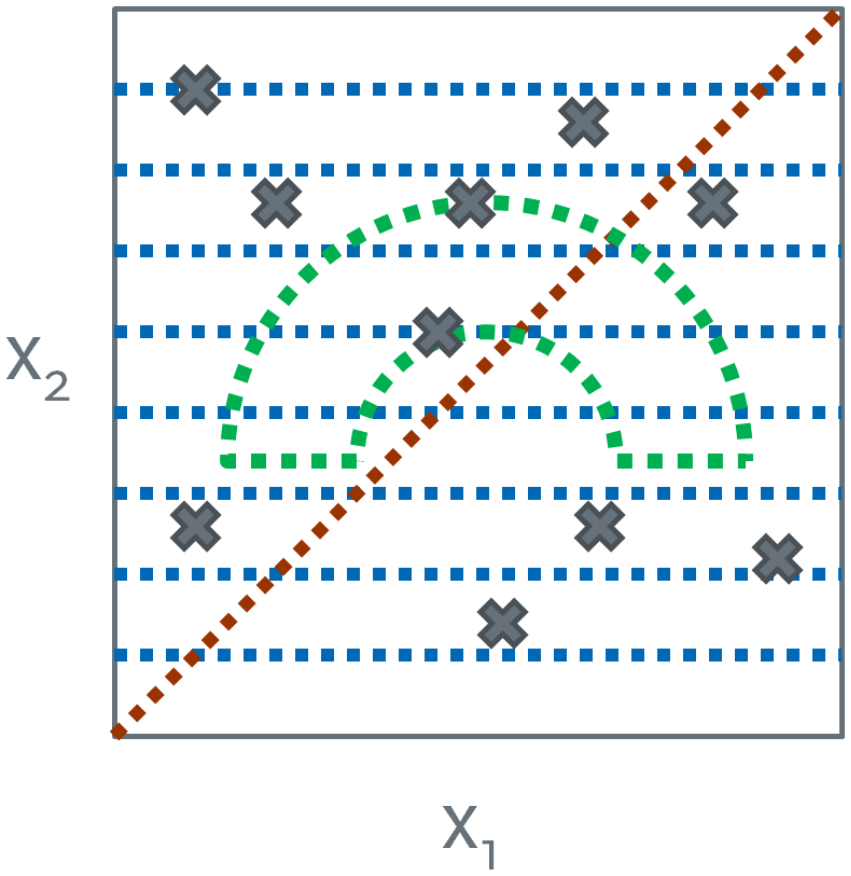
You can filter for specific parameters:



Usage Modes

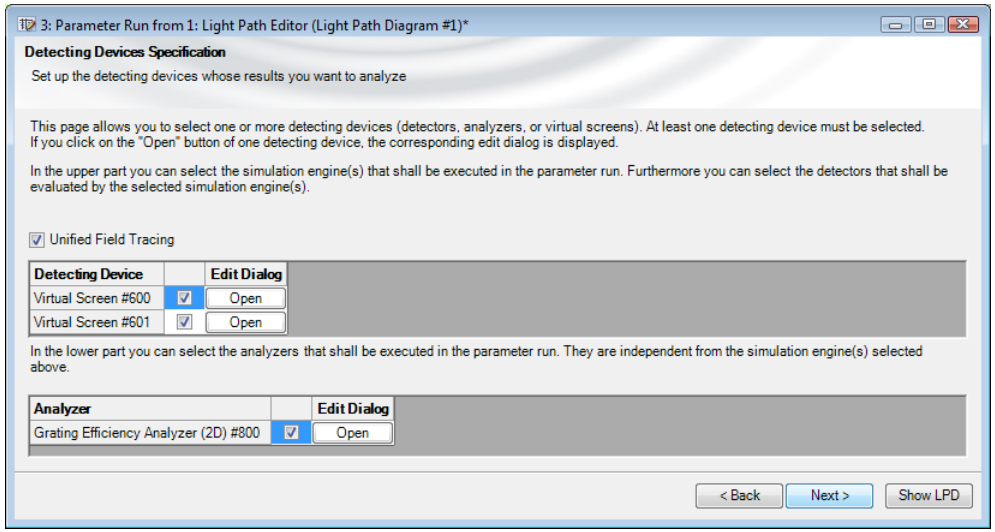
- **Standard Mode:**
  Linear variation of all selected parameters between minimum and maximum value.
- **Programmable Mode:**
  Customized parameter values per variation step. A table with the parameter values per variation step is filled by a snippet.
- **Scanning Mode:**
  Scan of parameter space – all possible parameter combinations are simulated.
- **Random Mode:**
  Random variation of parameters between minimum and maximum value. Sometimes also called Monte-Carlo-Simulation. A seed can be used for reproducible results.

Usage Modes



- Illustration of the different usage modes for the parameter run. A two-dimensional parameter space defined by two parameters X_1 and X_2 is shown.
- Red: Resulting parameter sets for the standard mode.
- Green: Example how the parameter sets can be generated by a snippet in the programmable mode.
- Blue: Resulting parameter sets for the scanning mode.
- Grey: Some randomly generated parameter sets.

Detecting Devices Specification Page

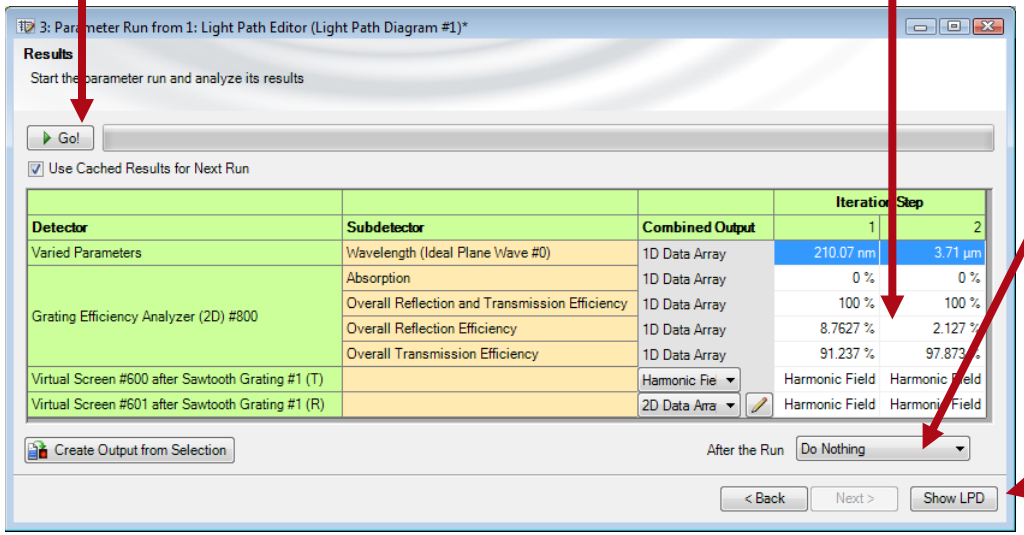


- This page allows to select which simulation engines, detectors, screens and analyzers are evaluated.
- The detecting devices can be configured after clicking *Open* to get to the edit dialog.

Results Page

Starts and stops the parameter variation.

Simulation results.
Double click on a document to view it in a separate window.



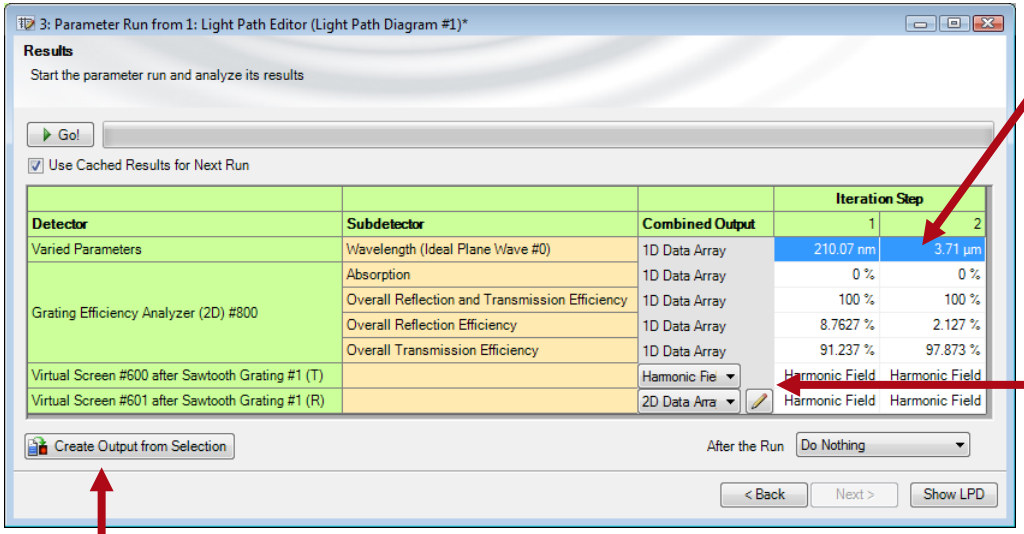
Allows you to save the results after the simulation has finished and then shut down your computer.

Displays the light path diagram.

In the Property Browser you can change the formatting of the shown physical values (number of digits and whether physical units are shown) so that you can better export them to e.g. spread sheet programs via copy and paste.

Results Page – Combined Outputs

- The results for each (sub-)detector can be combined into a Data Array, Animation, Harmonic Fields Set or Ray Distribution.
- Which combined outputs are available depends on the type and dimensionality of the original documents.



- Select the results to combine.
- Clicking on a cell in the Detector or Subdetector column selects the whole row.

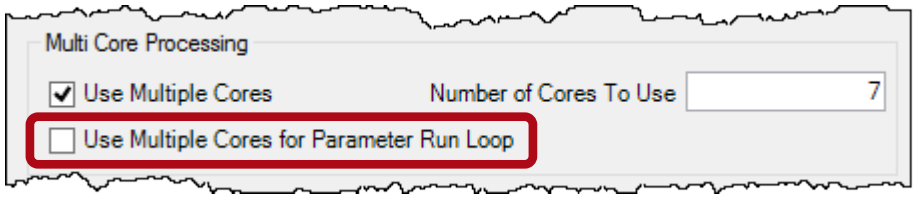
- Choose the desired combined output.
- Several combined outputs can be configured by clicking on the pencil icon.

Create the combined output – or stop the creation if it takes too long. Double clicking on a cell in the Detector or Subdetector column is a shortcut to selecting the whole row and start the output creation with the current combined output.

Parallelization & Amount of Data

- The execution of the Parameter Run simulations are very well parallelized. Thus it represents a very efficient method to simulate many different settings very fast.

- But in case already one simulation is extremely memory consuming, parallel executions are out of the question. They would not be possible or slow down the whole process if VirtualLab may swap such large data on hard disc instead of keeping it in the RAM.
- Then the parallelization should be switched off for the Parameter Run simulations.



Summary

- The Parameter Run document is a great tool if an optical system should be simulated multiple times with specific varying parameters or parameter combinations.

- VirtualLab provides various display options for the result, including animations.

- It is predestined for tolerance simulations.