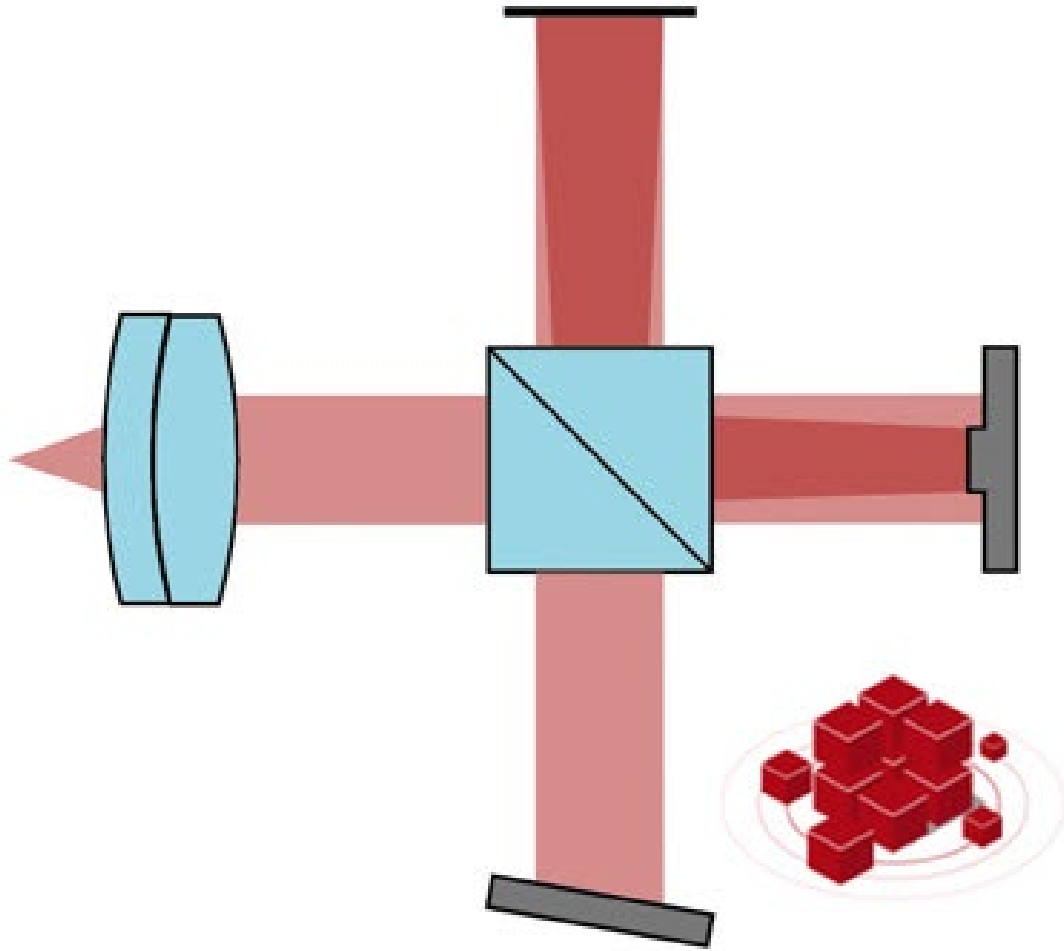


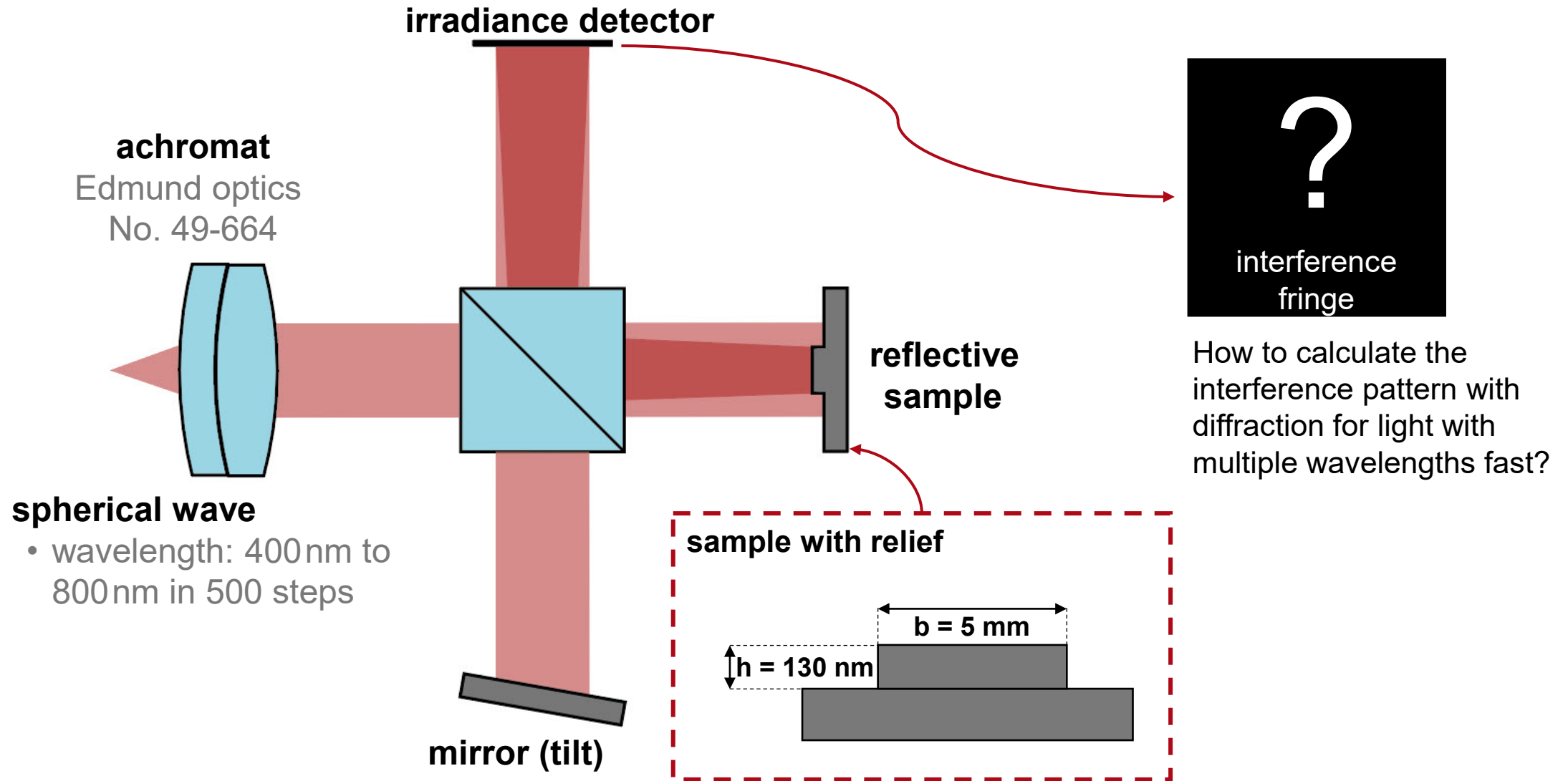
**Investigation of Diffraction in Interferometer Caused
by Sharp Relief – Analysis by Using Distributed
Computing**

Abstract

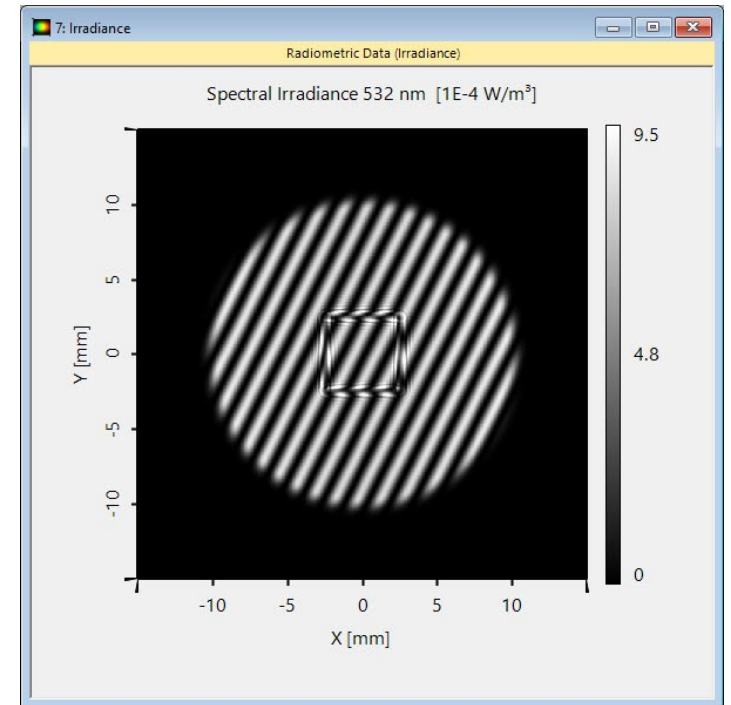
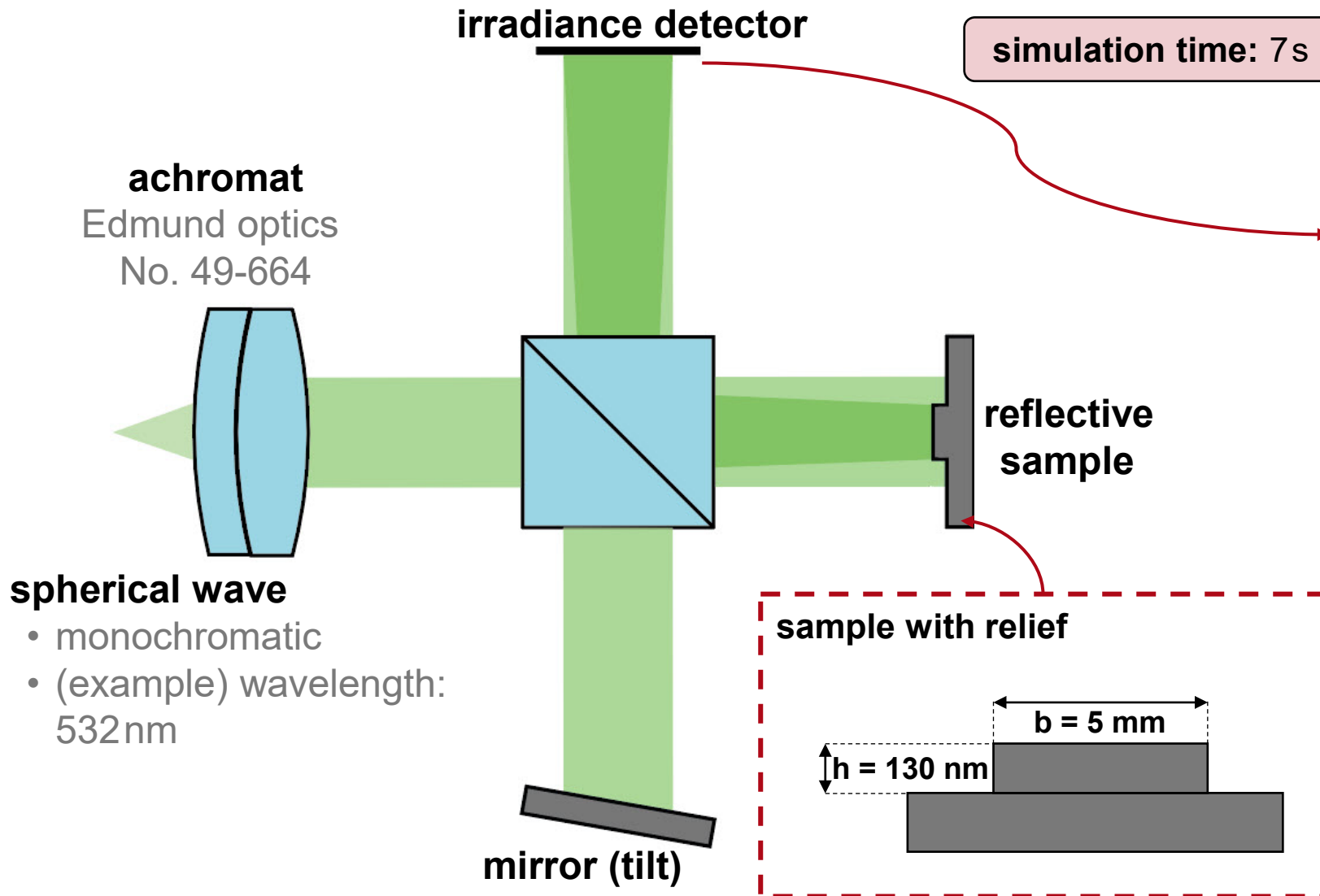


Interferometric optical setups can be used for the detailed investigation of samples. Within this use case we analyze the diffraction effects caused by a sample with a sharp relief in a Michelson interferometer. In order to model the white light source properly, the analysis comprises a set of 500 different wavelengths. By consecutive simulation steps, the overall simulation time would be in the range of one hour. By using the distributed computing in VirtualLab Fusion with a network of 24 clients on 6 multicore processor PCs, the simulation time can be reduced to less than 4 minutes.

Simulation Task



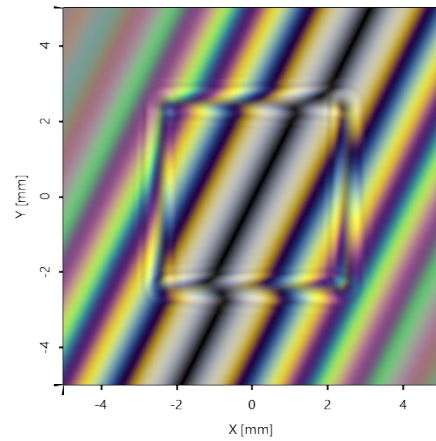
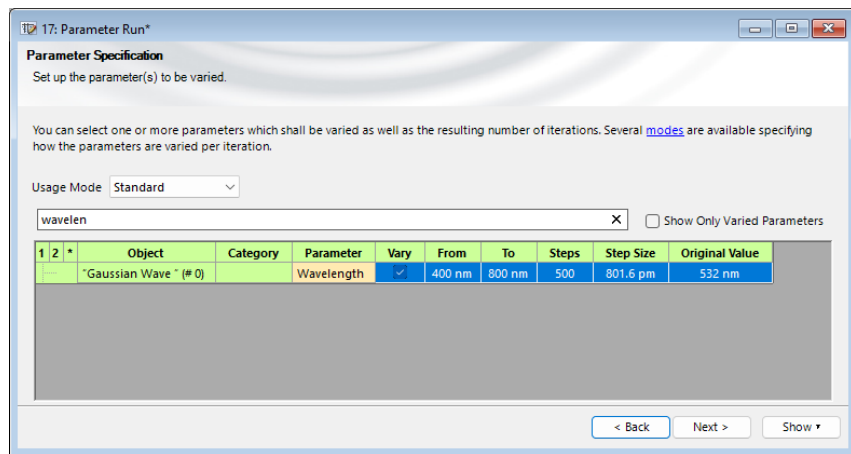
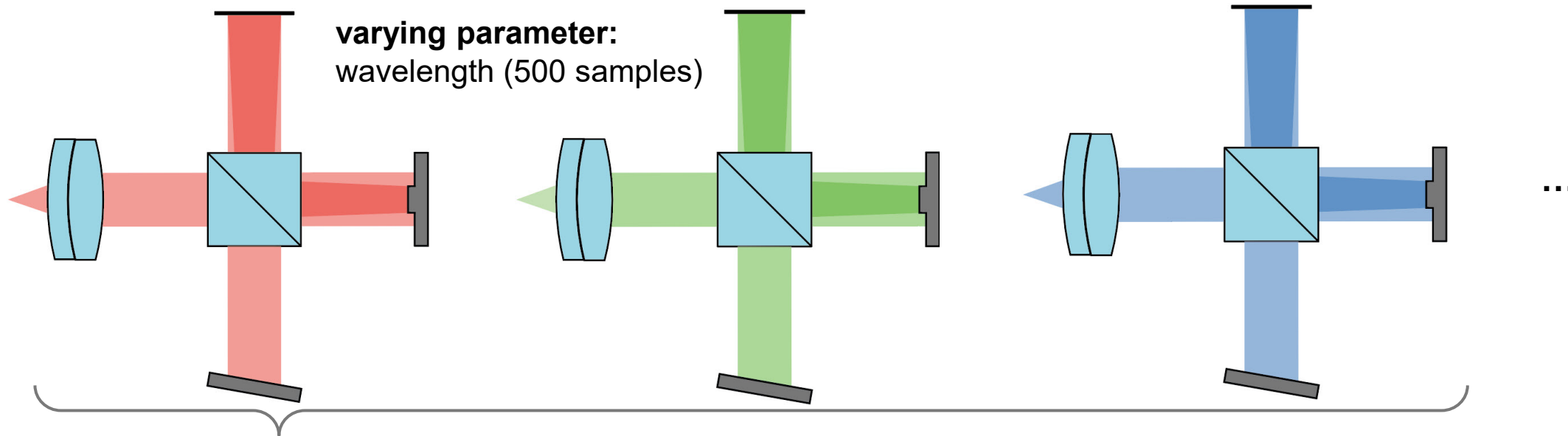
Elementary Simulation Task



For a detailed analysis of the elementary system, see:

[Investigation of Diffraction in Interferometer Caused by Sharp Relief](#)

Collection of Elementary Tasks: Variation of Wavelength



simulation result:
irradiance of all
wavelength modes.

simulation time
(500 simulations): 57 min

Distributed Computing

Computation time of complex tasks that require many individual simulations (such as parameter sweeps etc.) can be drastically reduced by using *Distributed Computing*. In this case, the individual simulations can be distributed to different workstations, each with several clients.

More information under:

[Usage of Distributed Computing](#)

The screenshot displays the Wyrowski VirtualLab Fusion 2023.2 (Build 1.242) interface. The main window shows an optical setup titled "5: Optical Setup View #4 (Interferometer with Sharp Relief Object)". The setup includes a Spherical Wave (0), an Achromat (Edmund Optics: 49664) (Turned) (1), an Ideal Beam Splitter (2), a Microstructure (8), and two Ideal Plane Mirrors (5 and 9). A Universal Detector (Irradiance) (606) is positioned at the output. The interface also features a "Distributed Computing" panel on the right, which includes a "Server Tools" section with "Stop Server", "Add Clients on Remote Machine", and "Start File" buttons. Below this is a "Clients" table showing the status of three remote machines.

Status	Host Machine	Clients	CPU	RAM
Green	It999.lighttrans2.local	(0 of 1)	0 %	3.3 %
Green	It888.lighttrans2.local	(0 of 2)	3 %	43.2 %
Green	It777.lighttrans2.local	(0 of 2)	1 %	6.4 %

Number optical setups in queue: 0

Logging

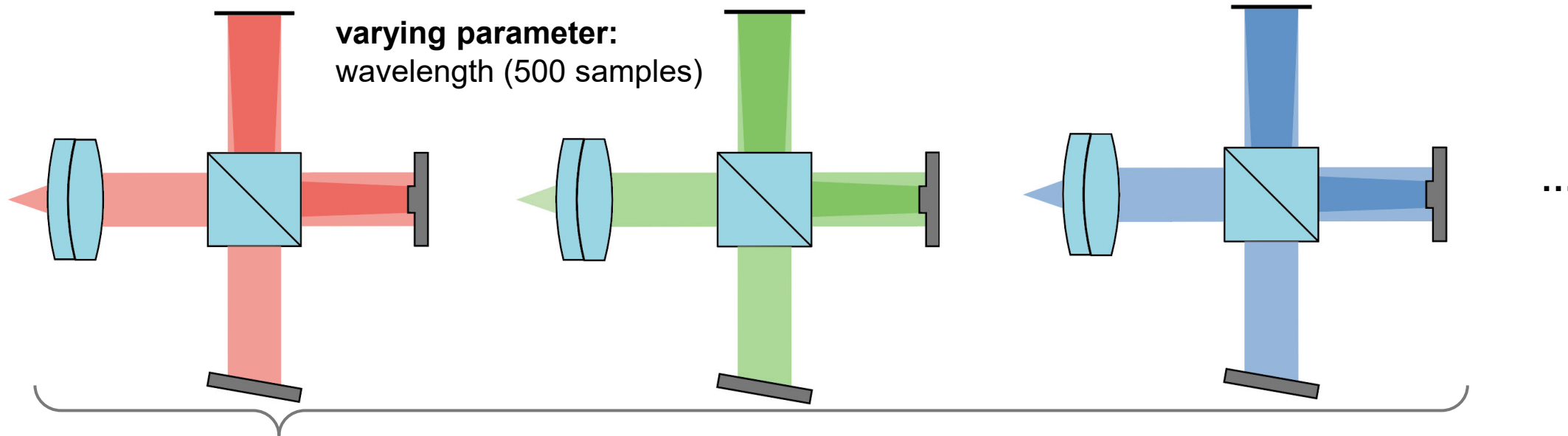
Messages

[2023-09-27 11:10:09] Output creation has been started.

Detector Results Messages

Current Global Options:options" (Changed Simulation Defaults; Number of Used Cores: 8) CPU Usage: 0 100% Physical Memory: 0 32 GiB

Collection Simulation Using Distributed Computing



Tip 17: Parameter Run*

Parameter Specification
Set up the parameter(s) to be varied.

Usage Mode: Standard

Object	Category	Parameter
Gaussian Wave (#0)	Wavelength	

Distributed Computing

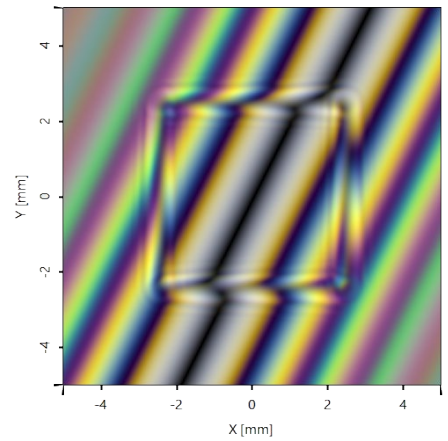
Server Tools

Stop Server | Add Clients on Remote Machine | Start File Watcher

Calculation on: Local Machine | Cloud

Status	Host Machine	Clients	CPU	RAM	Active	Disconnect
Active	It996.lighthtrans2.local	(0 of 4)	0%	34.4%	Active	Disconnect
Active	ws-It-014.lighthtrans2.local	(0 of 4)	0%	5.97%	Active	Disconnect
Active	It888.lighthtrans2.local	(0 of 4)	0%	8.95%	Active	Disconnect
Active	It998.lighthtrans2.local	(0 of 4)	0%	3.32%	Active	Disconnect
Active	It999.lighthtrans2.local	(0 of 4)	0%	44.9%	Active	Disconnect
Active	It777.lighthtrans2.local	(0 of 4)	5%	5.09%	Active	Disconnect

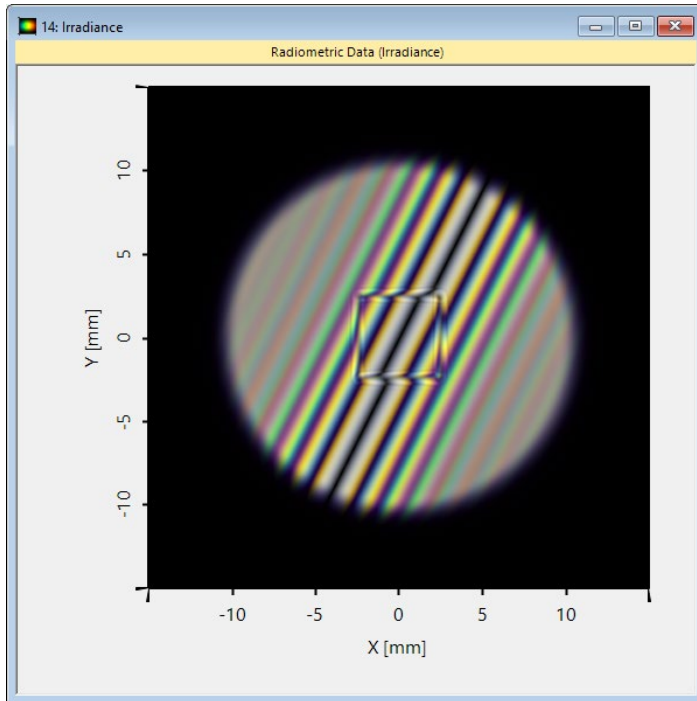
number of clients: 24



simulation result:
irradiance of all
wavelength modes

simulation time
(500 simulations): **3min 50s**

Overview Simulation Times



simulation result

	simulation time	
elementary simulation	7s	
collection of elementary simulations (500) on one machine	57 min	(100%)
collection of elementary simulations (500) via distributed computing (24 clients)	3min 50s	(7%)

93% lower calculation time!!!

Document Information

title	Investigation of Diffraction in Interferometer Caused by Sharp Relief – Analysis by Using Distributed Computing
document code	DC.0002
document version	1.1
software edition	<ul style="list-style-type: none">• VirtualLab Fusion Basic• Distributed Computing Package
software version	2023.2 (Build 1.242)
category	Application Use Case
further reading	<ul style="list-style-type: none">- <u>Investigation of Diffraction in Interferometer Caused by Sharp Relief</u>- <u>Usage of Distributed Computing</u>- <u>Coherence Measurement in Michelson Interferometer – Analysis by using Distributed Computing</u>- <u>Test Image Simulation of an AR Waveguide using Distributed Computing</u>