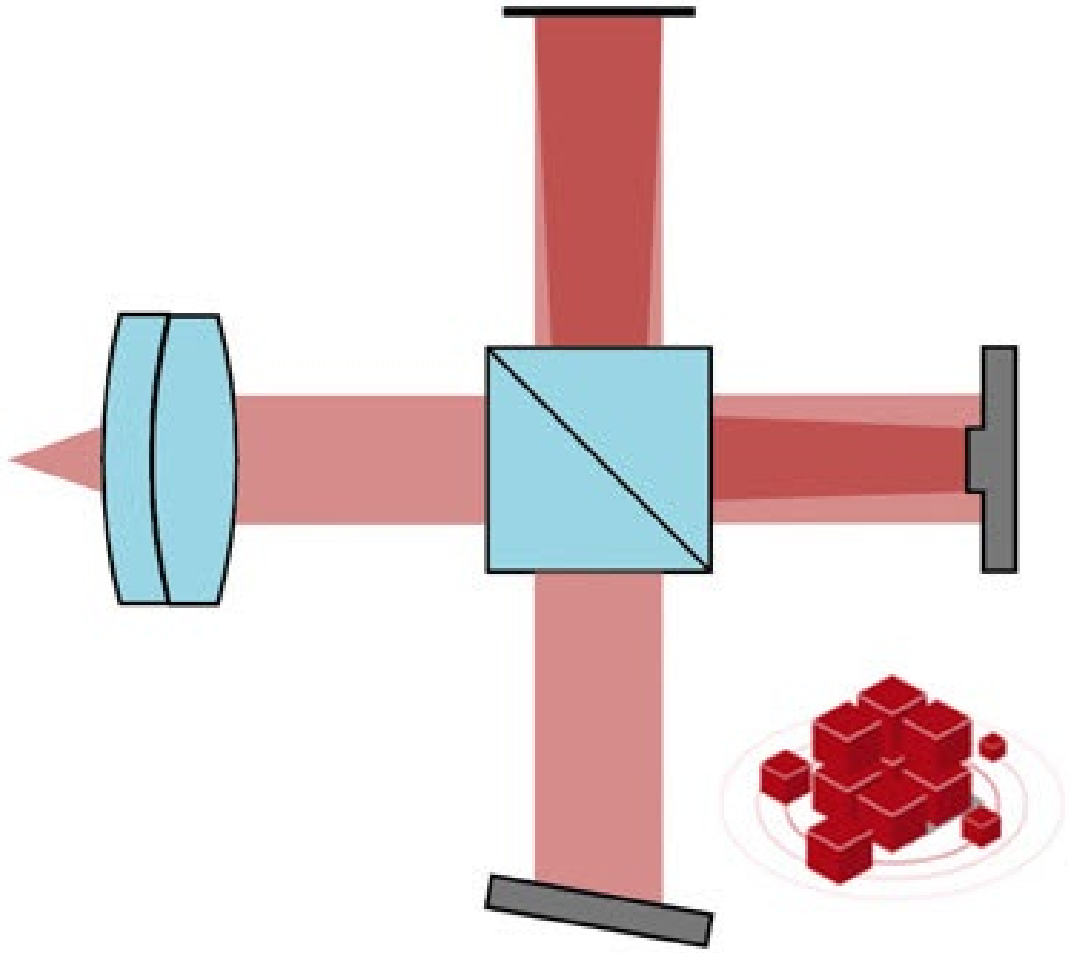
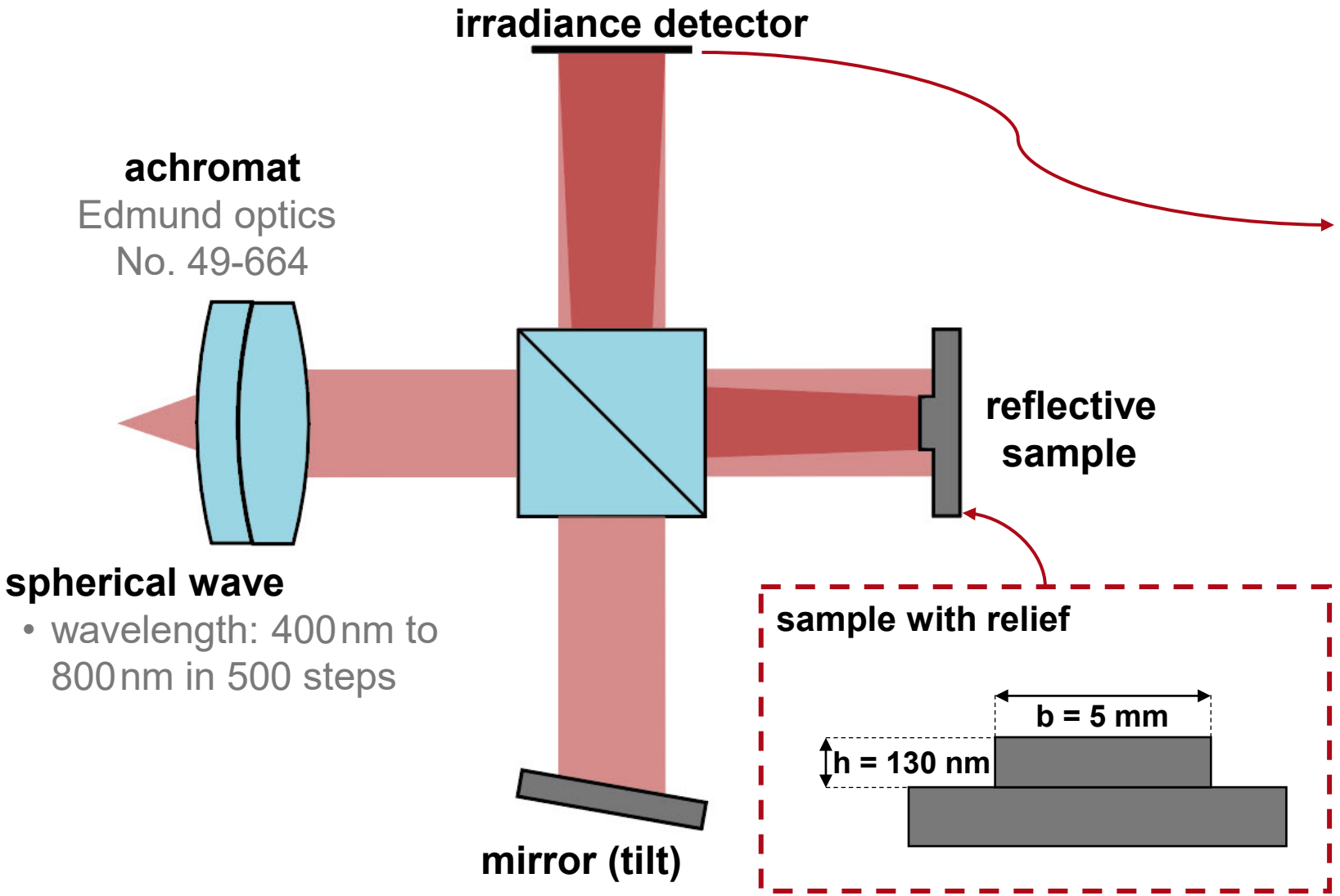
Investigation of Diffraction in Interferometer Caused by Sharp Relief – Analysis by Using Distributed Computing

Abstract



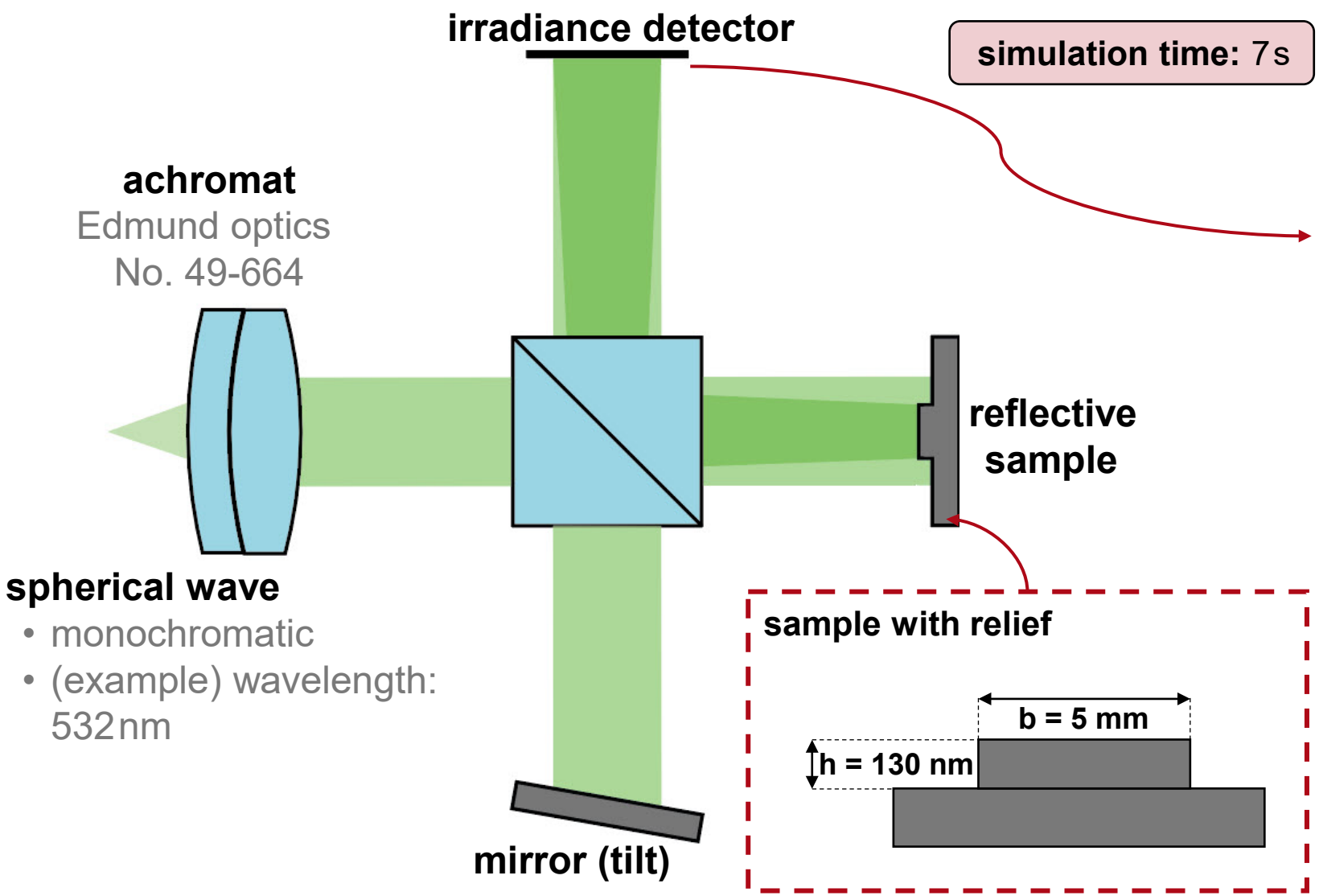
Interferometric optical setups can be used for the detailed investigation of samples. Within this use case we analyze the diffraction effects caused by a sample with a sharp relief in a Michelson interferometer. In order to model the while light source properly, the analysis comprises a set of 500 different 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.

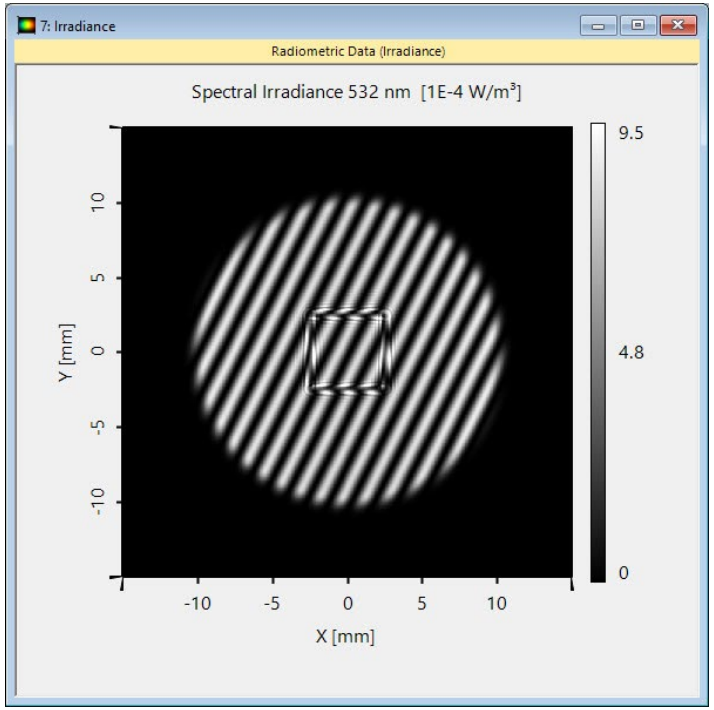
Simulation Task



How to calculate the interference pattern with diffraction for light with multiple wavelengths fast?

Elementary Simulation Task

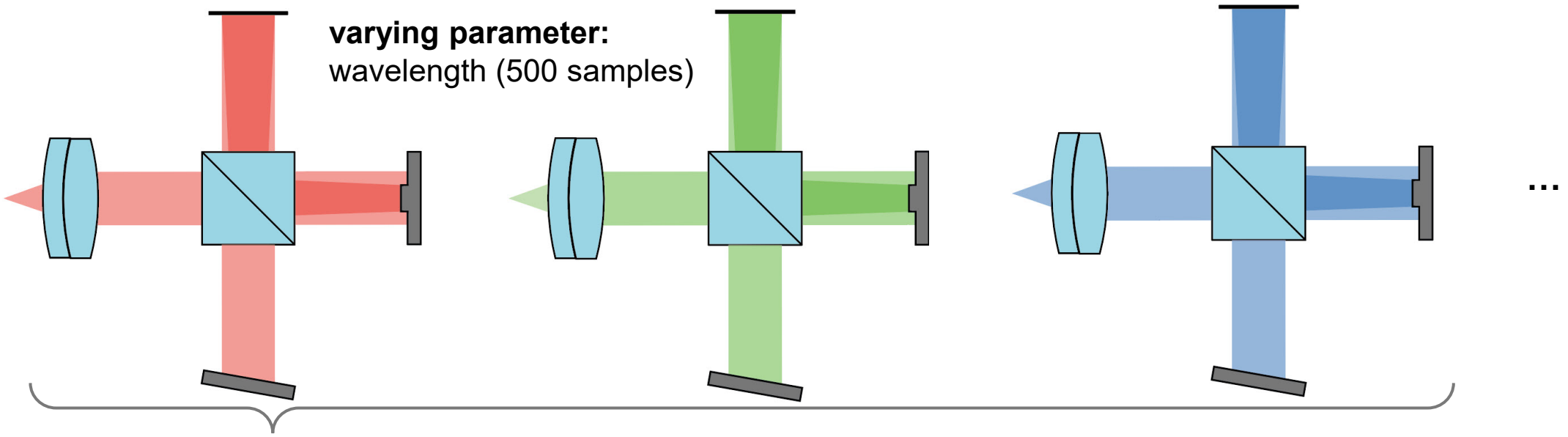


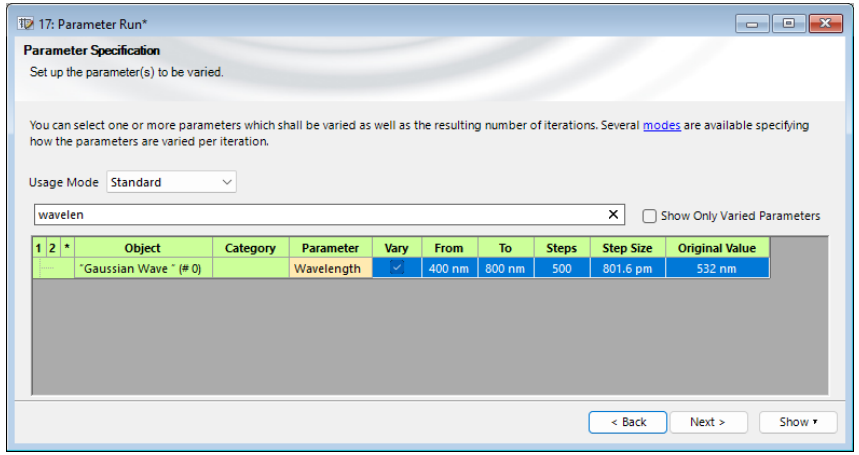


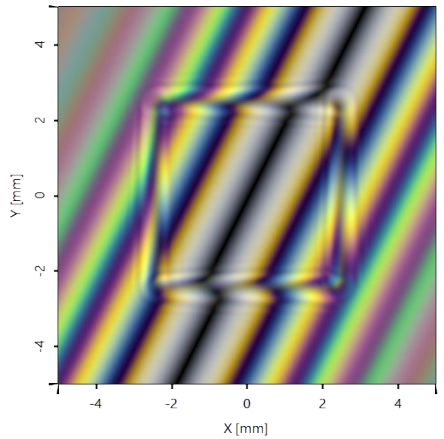
For a detailed analysis of the elementary system, see:

Investigation of Diffraction in Interferometer Caused by Sharp Relief

Collection of Elementary Tasks: Variation of Wavelength







simulation result:
irradiance of all wavelength modes.

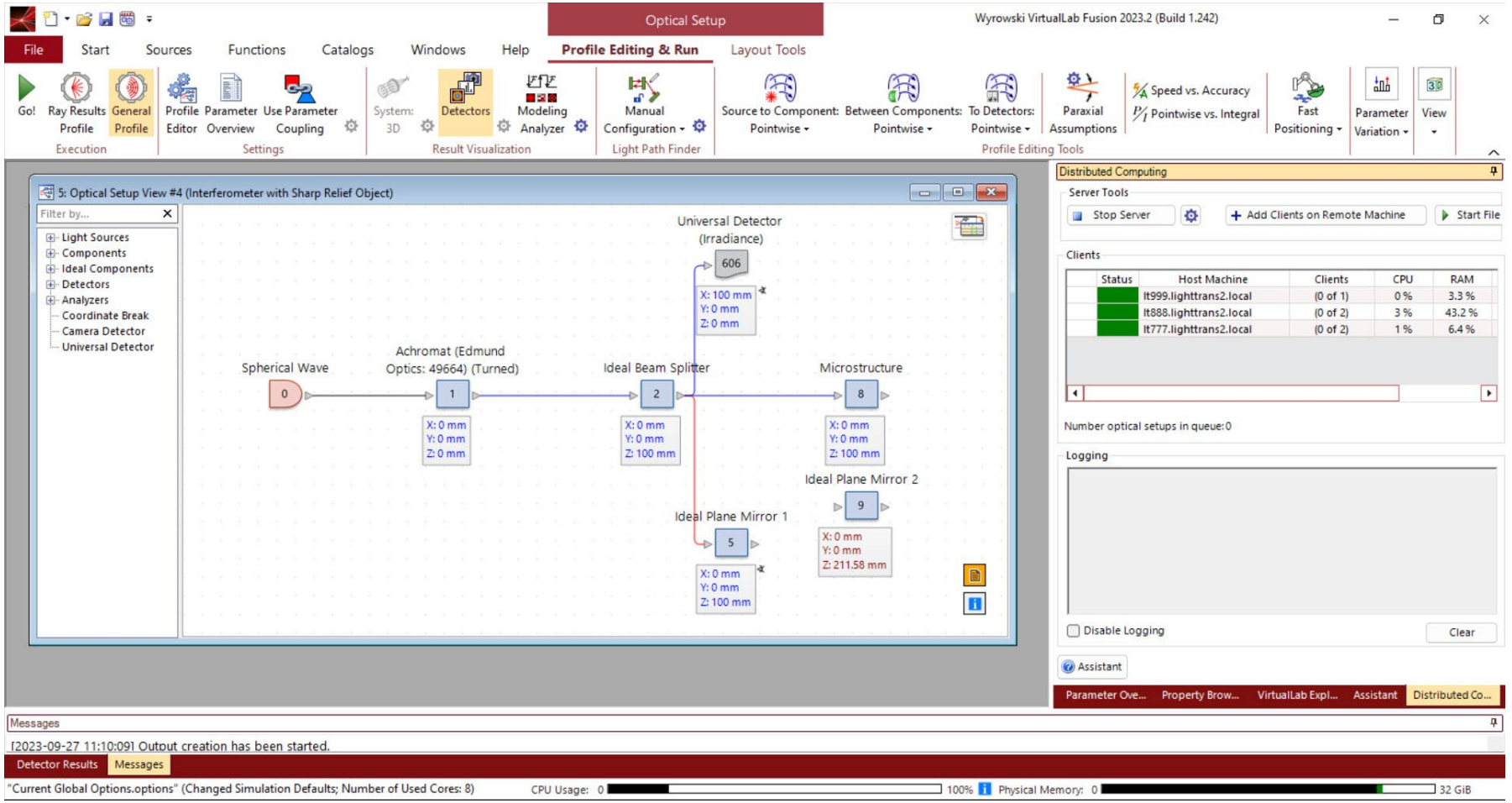
simulation time (500 simulations): 57 min

Distributed Computing

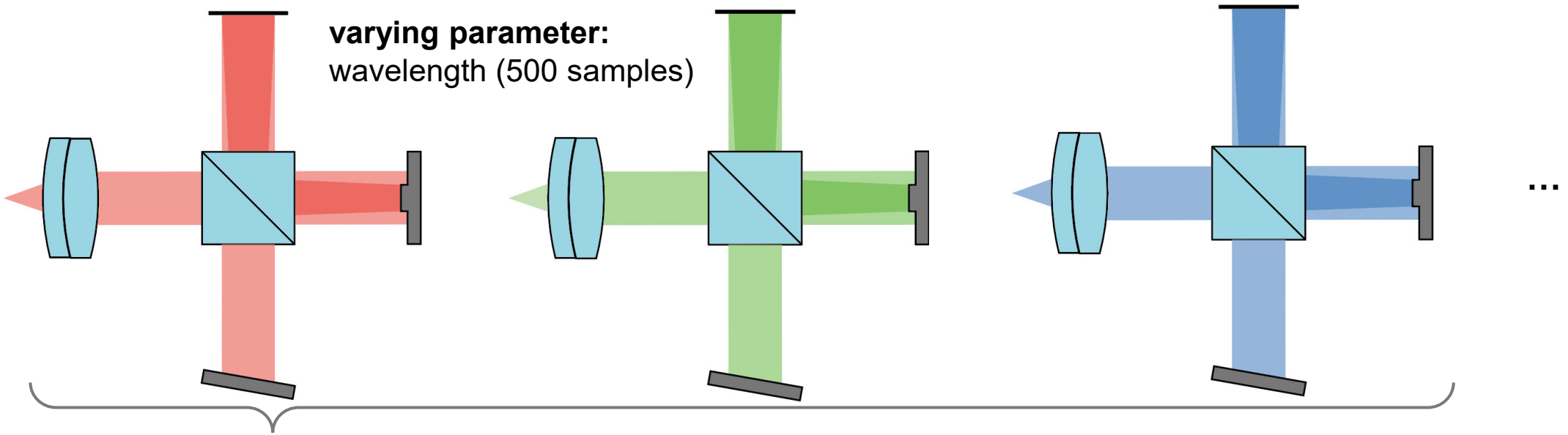
Computation time of complex tasks that require many individual simulations (such as parameter sweeps etc.) can be drastically reduced by using *Distributed Computing*. In this case, the individual simulations can be distributed to different workstations, each with several clients.

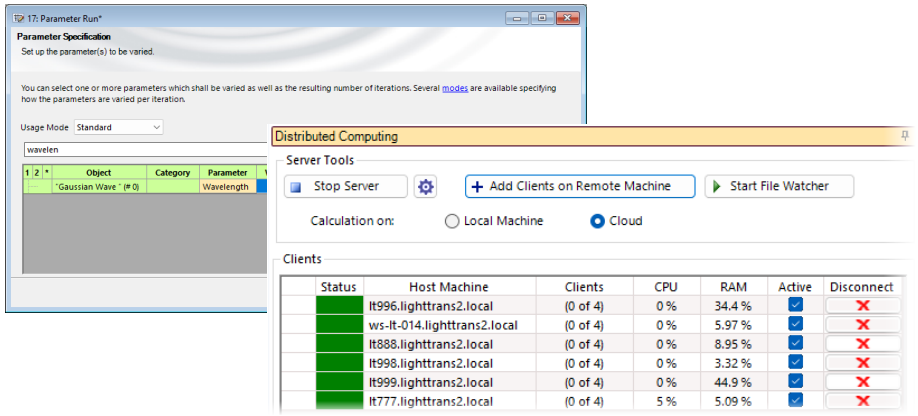
More information under:

Usage of Distributed Computing

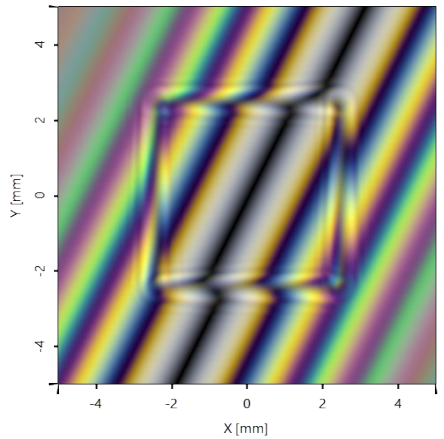


Collection Simulation Using Distributed Computing





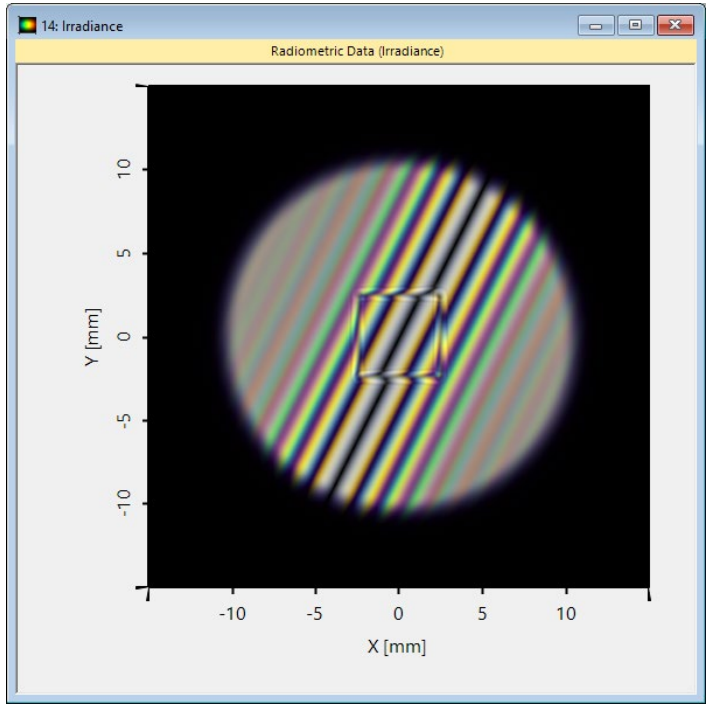
number of clients: 24



simulation result:
irradiance of all wavelength modes

simulation time (500 simulations): 3 min 50 s

Overview Simulation Times



simulation result

	simulation time	
elementary simulation	7 s	
collection of elementary simulations (500) on one machine	57 min	(100%)
collection of elementary simulations (500) via distributed computing (24 clients)	**3 min 50 s**	**(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
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further reading	- Investigation of Diffraction in Interferometer Caused by Sharp Relief - Usage of Distributed Computing - Coherence Measurement in Michelson Interferometer – Analysis by using Distributed Computing - Test Image Simulation of an AR Waveguide using Distributed Computing