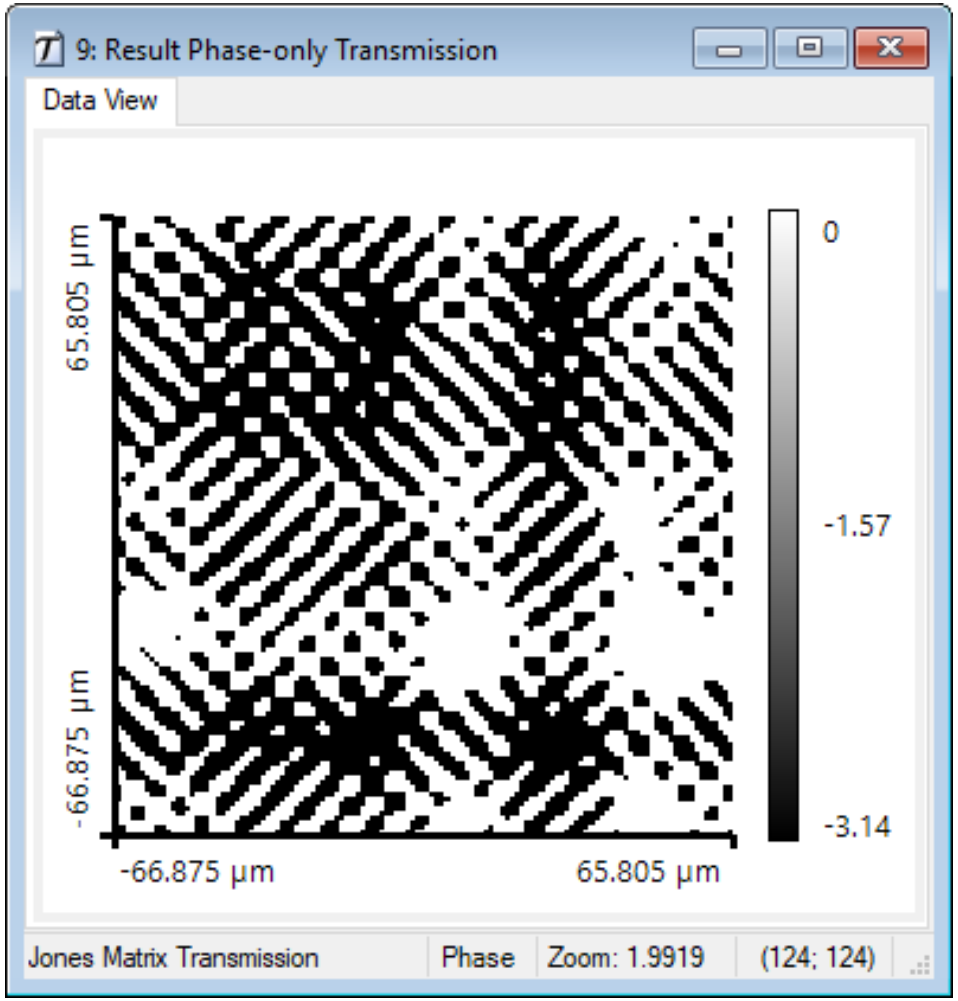
Design of Diffractive Beam Splitters for Generating a 2D Light Mark

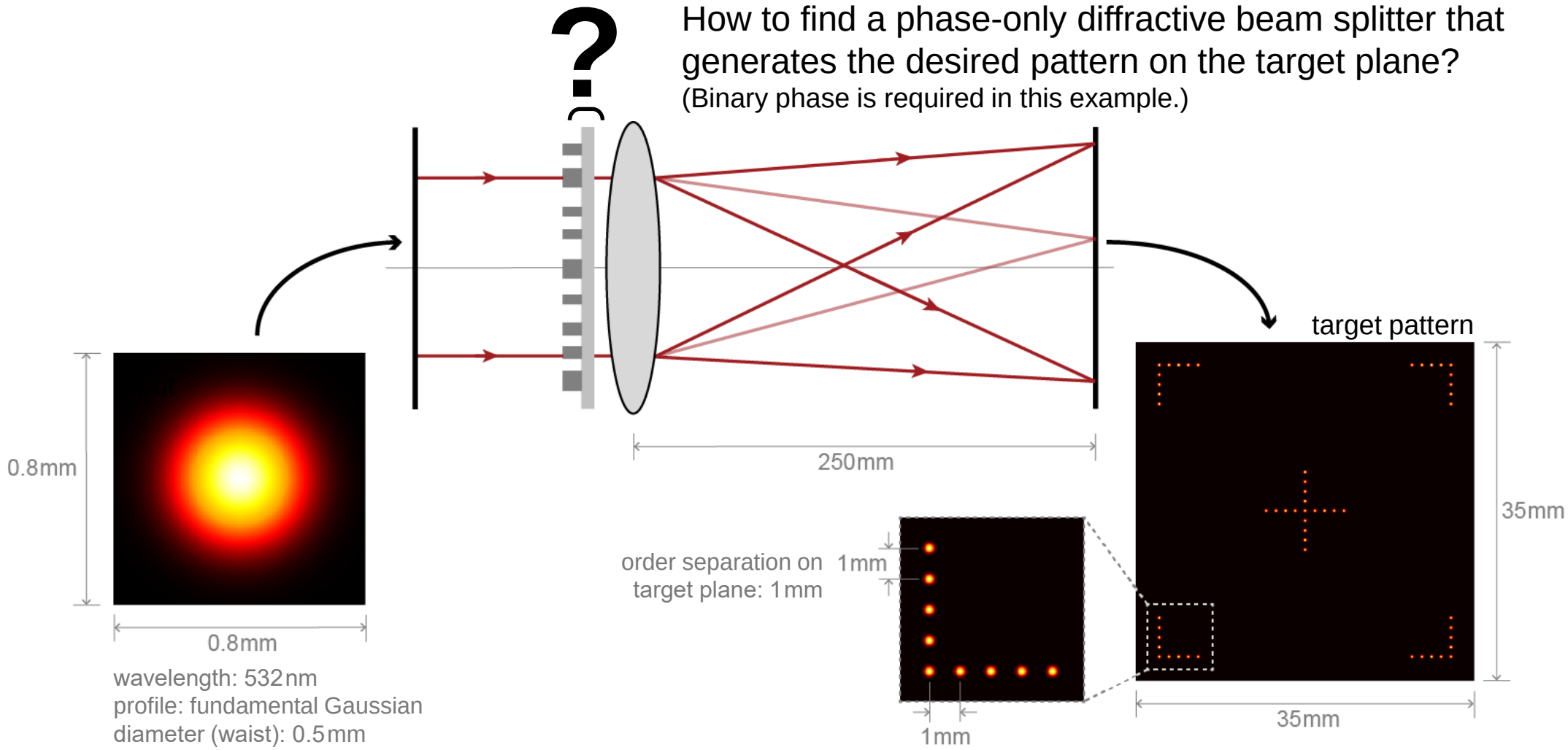
Abstract



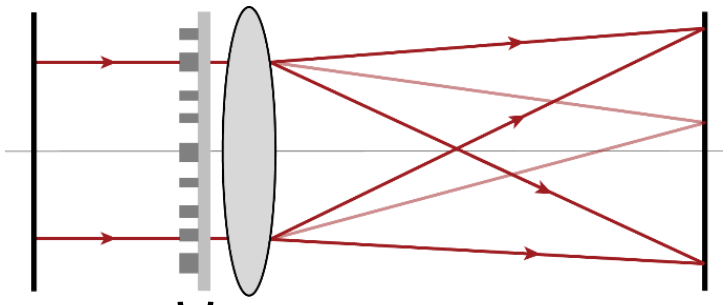
Applications of diffractive beam splitters can be found in e.g. laser material processing, optical metrology, lighting and many more. By using the iterative Fourier transform algorithm (IFTA) in VirtualLab Fusion, customized beam splitters can be designed efficiently and flexibly for specific target patterns, like an expected light mark as in this example. Various merit functions are available for the evaluation and further optimization of the designs.

Design Task

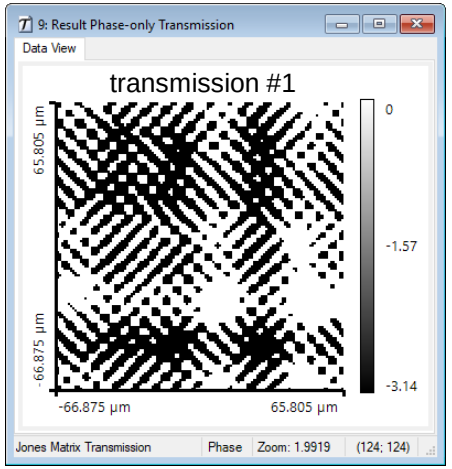
How to find a phase-only diffractive beam splitter that generates the desired pattern on the target plane?
(Binary phase is required in this example.)

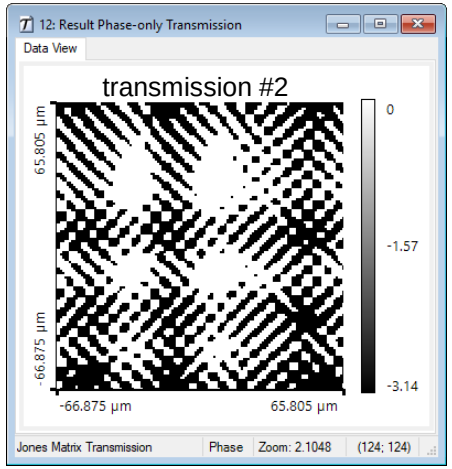


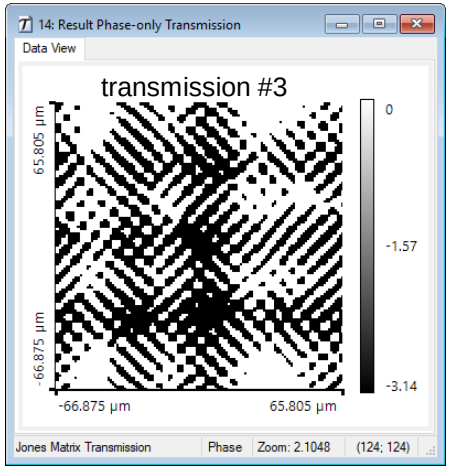
Design Results



Beginning with different random phase distributions on the target plane, the iterative Fourier transform algorithm (IFTA) calculates different possible design results.







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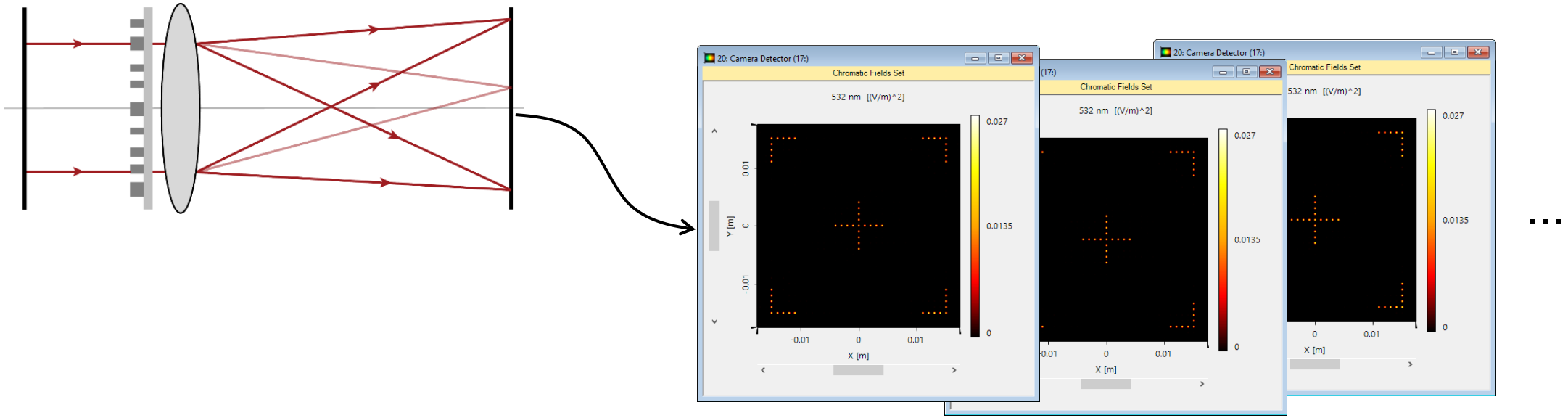
100 designs delivered within 200 seconds!
(2 seconds per design)

Performance Evaluation



Fast physical-optics simulation of the complete optical system gives access to multiple merit functions at once.

Merit functions	Design #1	Design #2	Design #3	...
conversion efficiency	65.92%	66.38%	64.71%	
uniformity error	4.31%	3.69%	6.76%	
stray light	3.99%	5.17%	3.11%	

Document Information

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category	Application Use Case
further reading	- Design of a Diffractive Diffuser to Generate a LightTrans Mark - Diffraction Pattern Calculation from a Reflection-Type Diffractive Beam Splitter