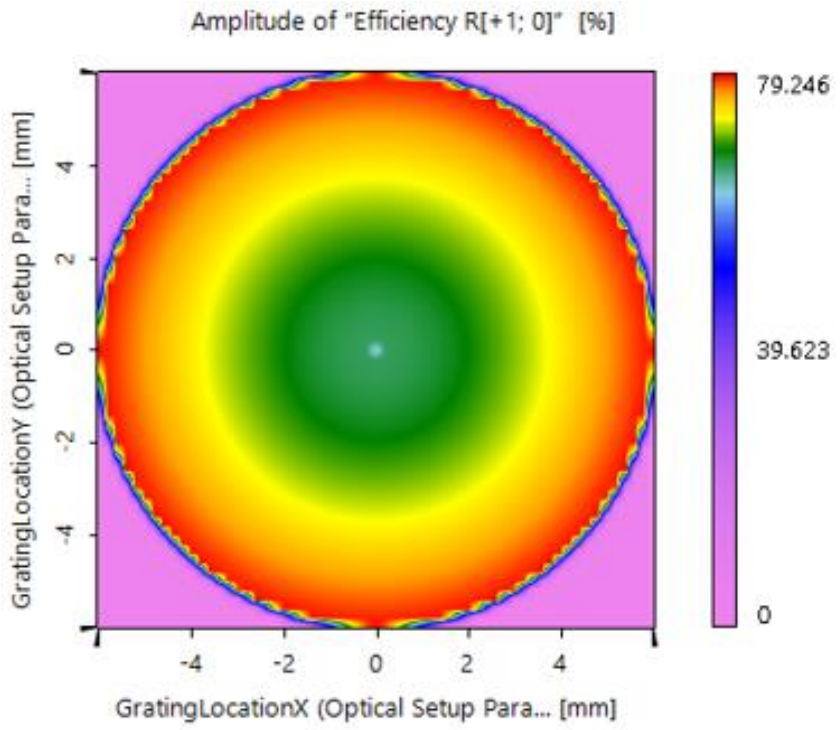
Calculation of Diffraction Efficiency for a Reflective Volume Holographic Grating generated by a Spherical Wave

Abstract



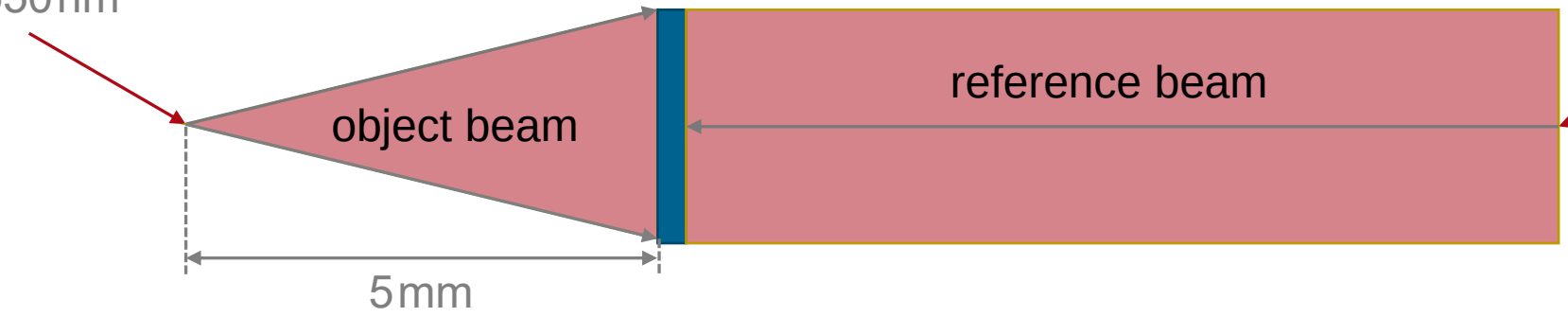
In this Demo the diffraction efficiency of a volume holographic grating is investigated, which was generated by an impinging spherical and plane wave. The rigorous modeling solver FMM (RCWA) is applied for accurate calculation of the efficiencies. The rotation-symmetry of the setup is exploited, in order to significantly reduce the calculation time.

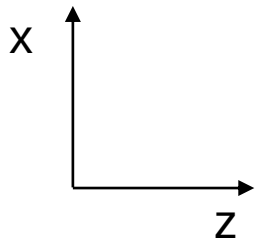
Task: Efficiency Calculation for a Volume Holographic Grating

object: point source
position = (0,0,0) mm
wavelength: 550 nm

photosensitive volume
material

reference beam:
plane wave
wavelength: 550 nm



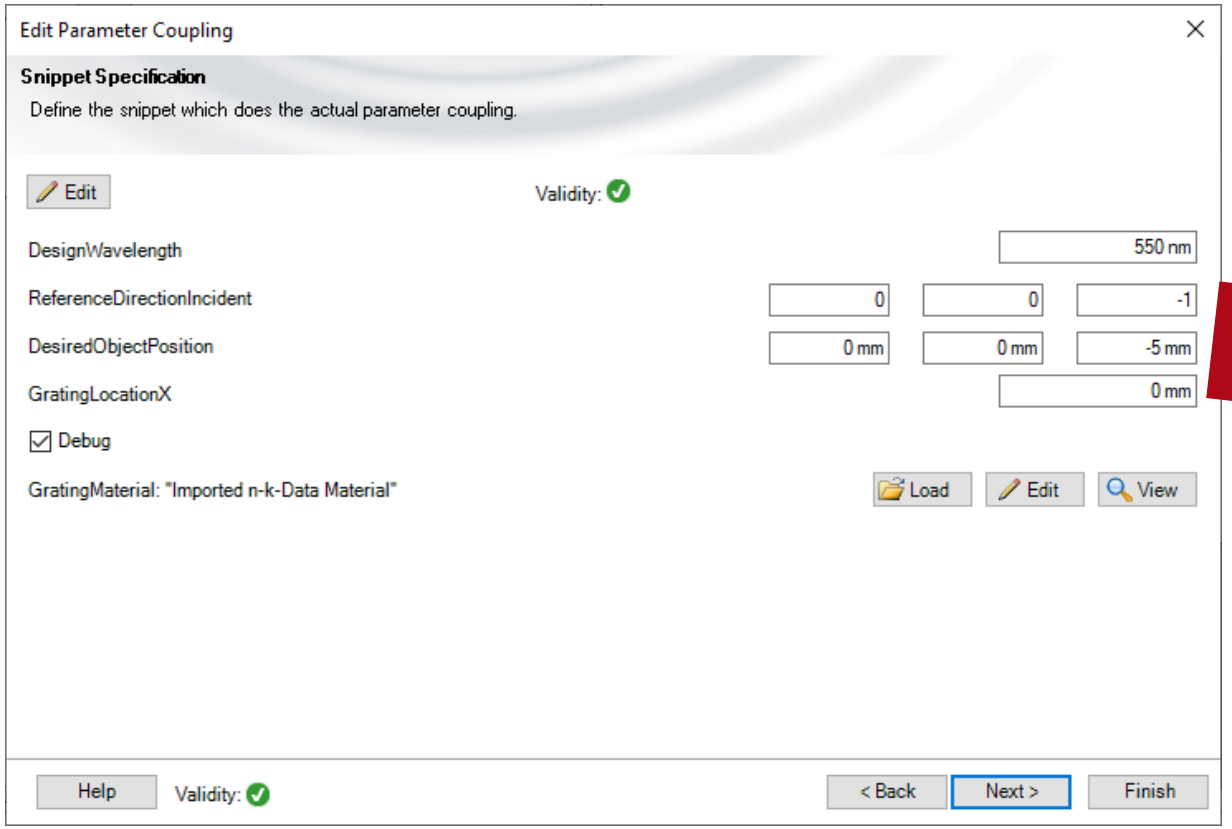


photosensitive volume
material parameters:

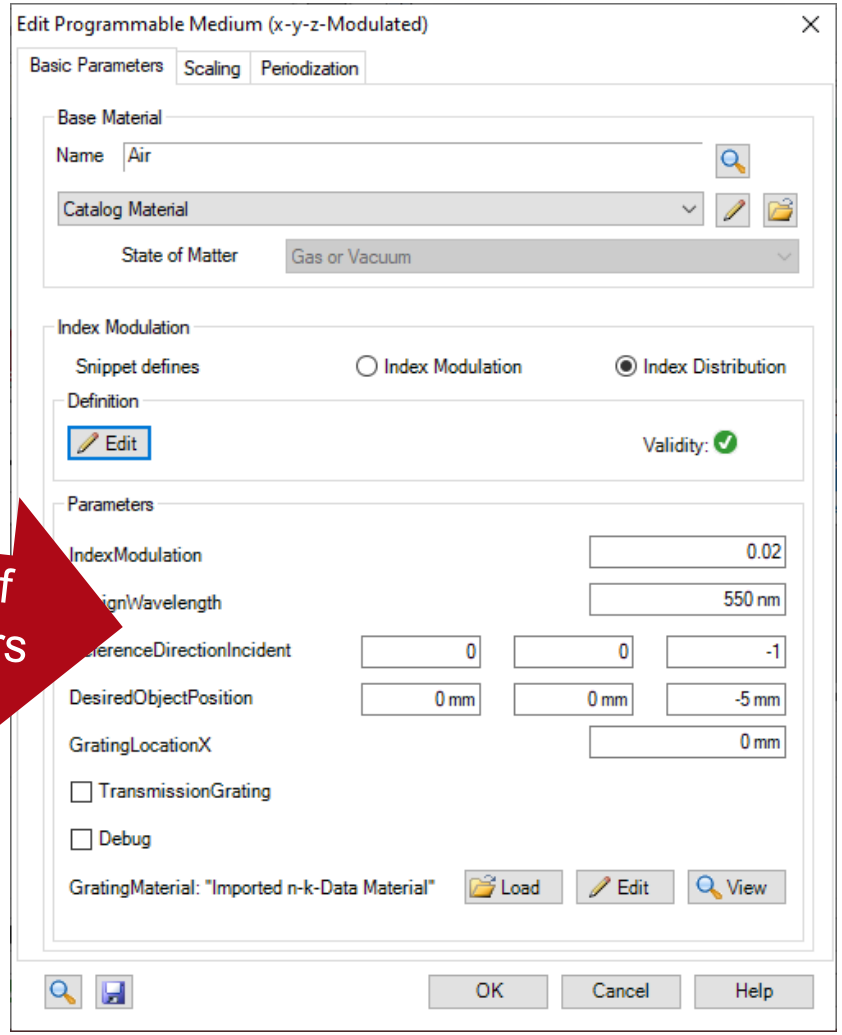
- thickness: 10 and 20 µm
- refractive index: 1.4599
- index modulation: 0.02

Modeling Strategy

- Take advantage of the rotational symmetry of the volume hologram, thus just the calculation along the radius has to be done
- Local linear grating (LLGA) is assumed and realized by a combination of programmable medium and parameter coupling

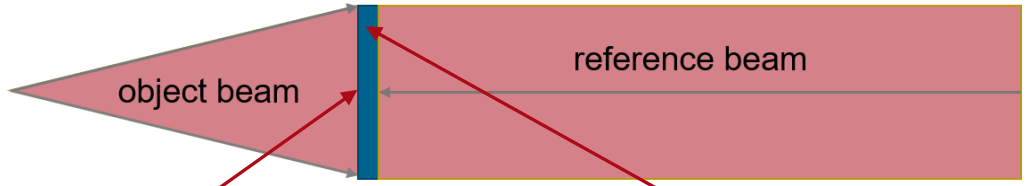


control of parameters

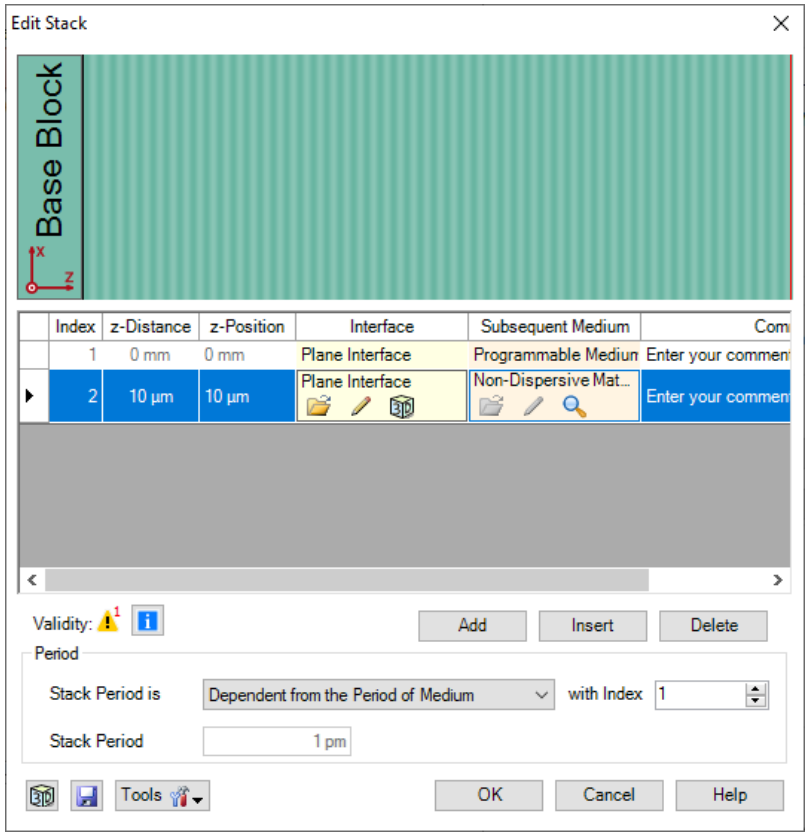


Modeling Strategy

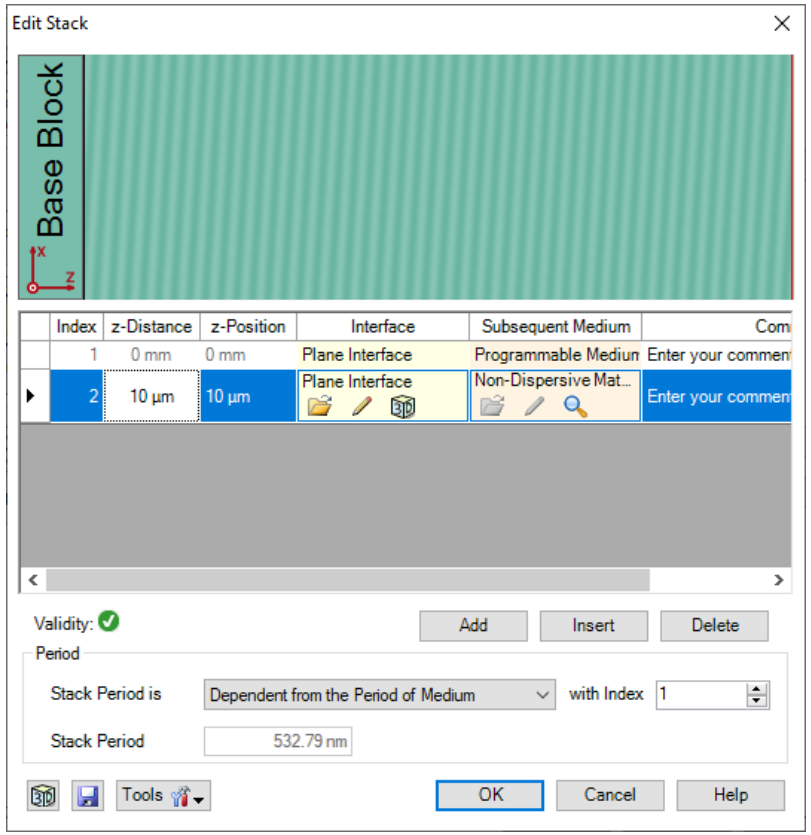
Local linear grating (LLGA) is assumed and realized by a combination of programmable medium and parameter coupling



locally assumed grating at x = 0

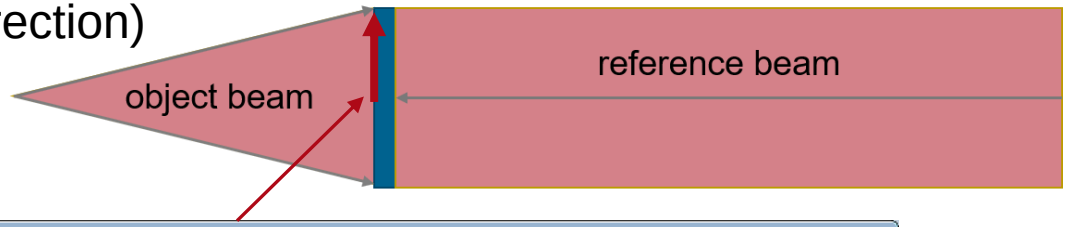


locally assumed grating at x = 5mm



Modeling Strategy

Further, a parameter run is used to scan the positions of the holographic medium along the radius (e.g. in x-direction)



4: Parameter Run along x-Position

Results

Start the parameter run and analyze its results

Go!

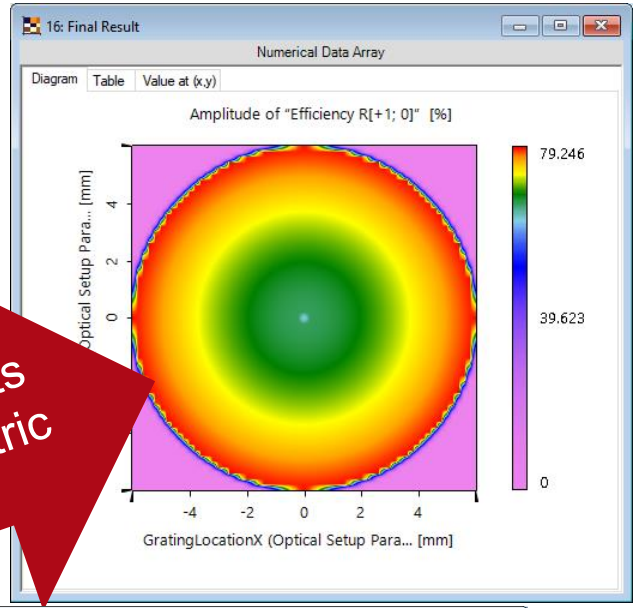
Use Already Calculated Results for Next Run

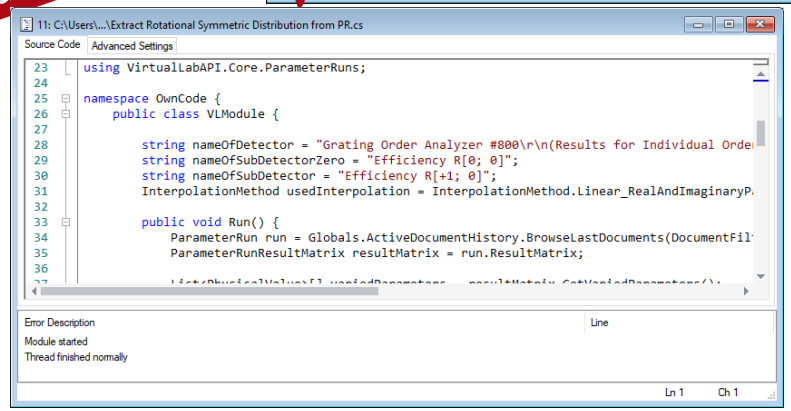
			Iteration Step						
Detector	**Subdetector**	**Combined Output**	1	2	3	4	5		
Varied Parameters	GratingLocationX (Optical...	Data Array	0 mm	200 µm	400 µm	600 µm	800 µm		
Coupled Parameters	Constant Refractive Index (...	Data Array	1.4599	1.4599	1.4599	1.4599	1.4599		
	DesignWavelength (Volum...	Data Array	550 nm	550 nm	550 nm	550 nm	550 nm	55	
	DesiredObjectPosition X (...	Data Array	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm	
	DesiredObjectPosition Y (...	Data Array	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm	
	DesiredObjectPosition Z (V...	Data Array	-5 mm	-5 mm	-5 mm	-5 mm	-5 mm	-5 mm	
	GratingLocationX (Volume...	Data Array	0 mm	200 µm	400 µm	600 µm	800 µm	1 mm	
	Period x-Direction (Volume...	Data Array	+inf mm	9.426 µm	4.7243 µm	3.162 µm	2.3846 µm	1.921 µm	1.
	Period y-Direction (Volume...	Data Array	+inf mm	+inf mm	+inf mm	+inf mm	+inf mm	+inf mm	
	Period z-Direction (Volume...	Data Array	188.37 nm	188.44 nm	188.67 nm	189.04 nm	189.56 nm	190.22 nm	19
	ReferenceDirectionIncident...	Data Array	0	0	0	0	0	0	

Create Output from Selection

< Back | Next > | Show

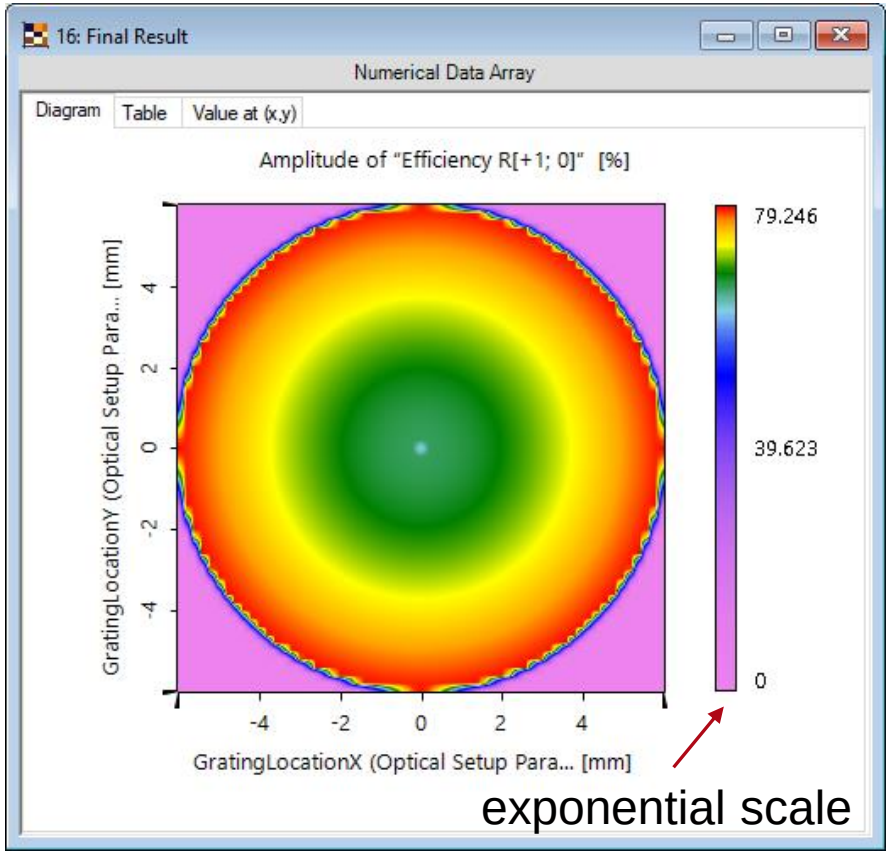
combination of results into rotation symmetric distribution



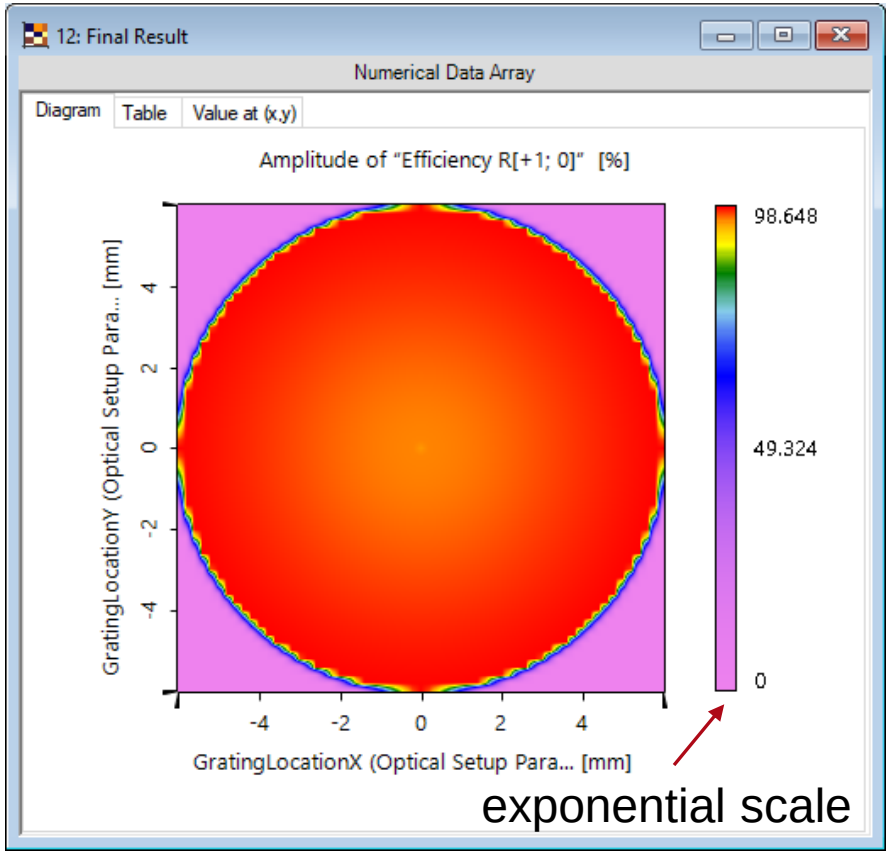


Result for 10μm & 20μm Thick of Holographic Material

10μm holographic grating



20μm holographic grating



Document Information

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further reading	