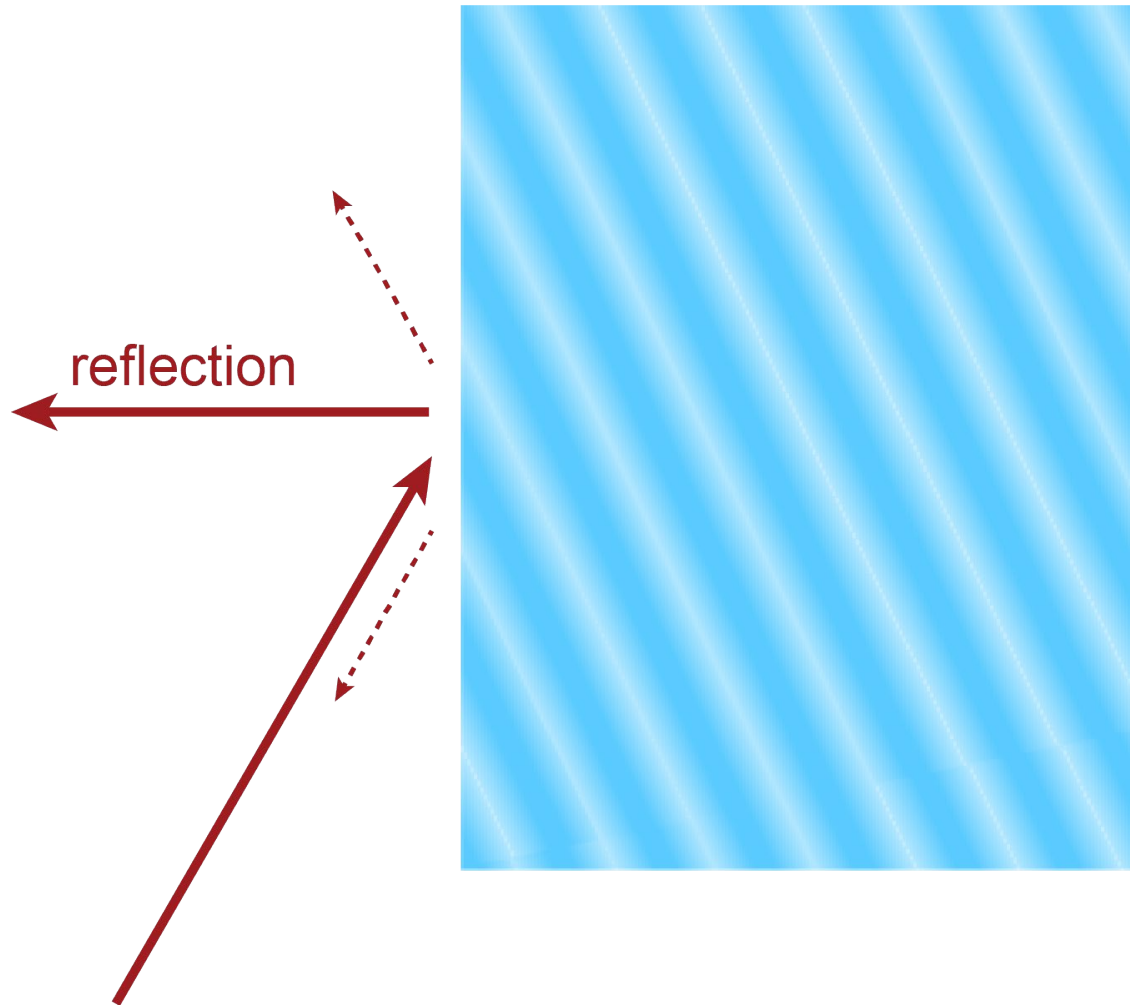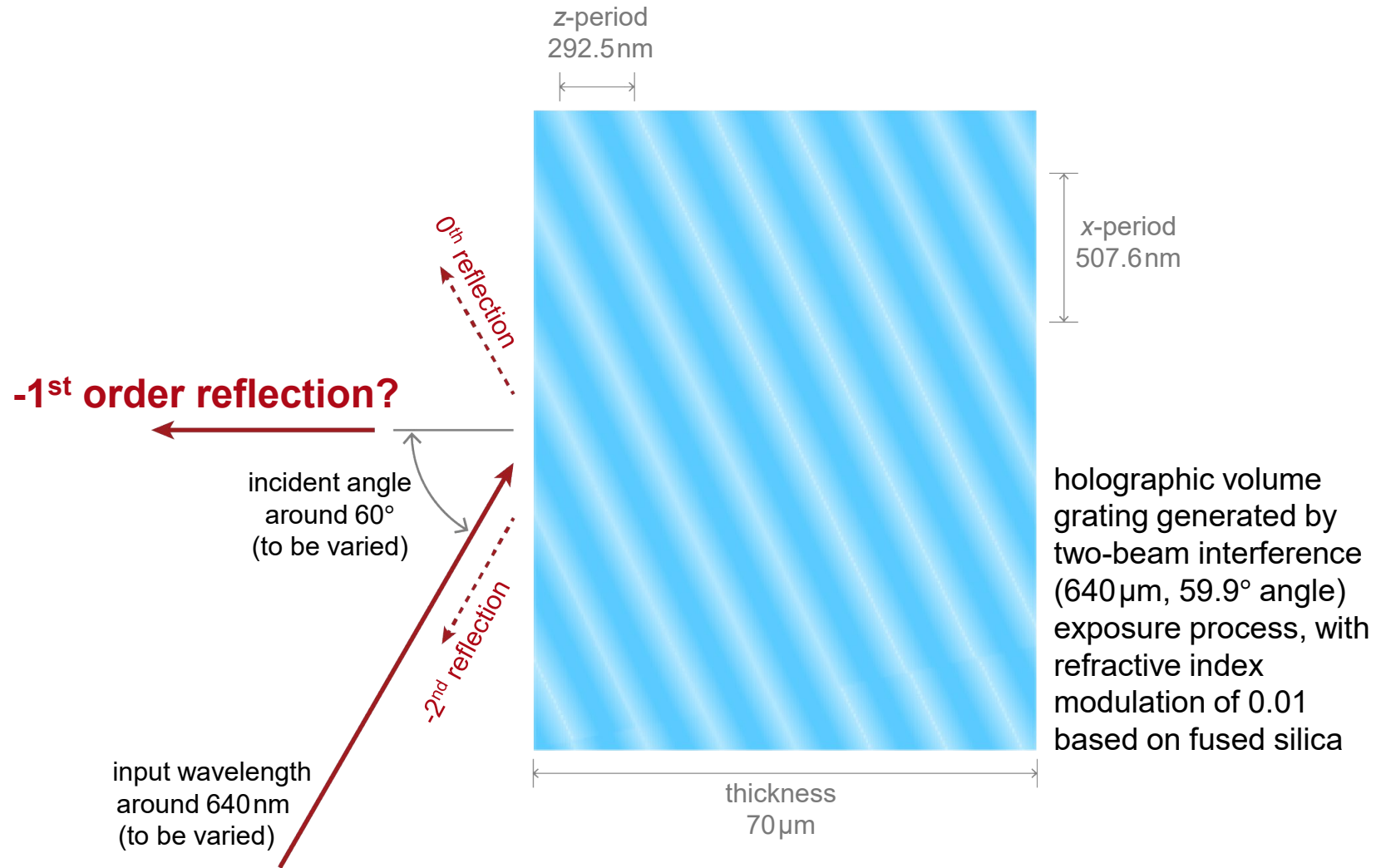# Rigorous Simulation of Holographic Generated Volume Grating
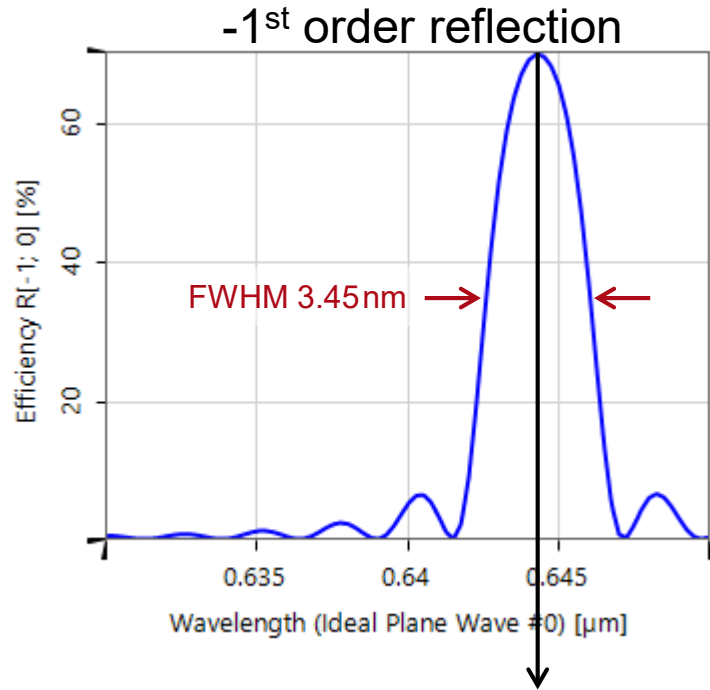
Abstract

reflection

Holographic generated volume gratings, with a thickness much larger than the wavelength, often shows a narrow bandwidth around wavelength and angle. Following the two-beam interference exposure process, a volume grating inside fused silica is generated and simulated with the rigorous Fourier modal method (FMM) in VirtualLab Fusion. Both the spectral and angular dependent reflection property of the grating are analyzed.
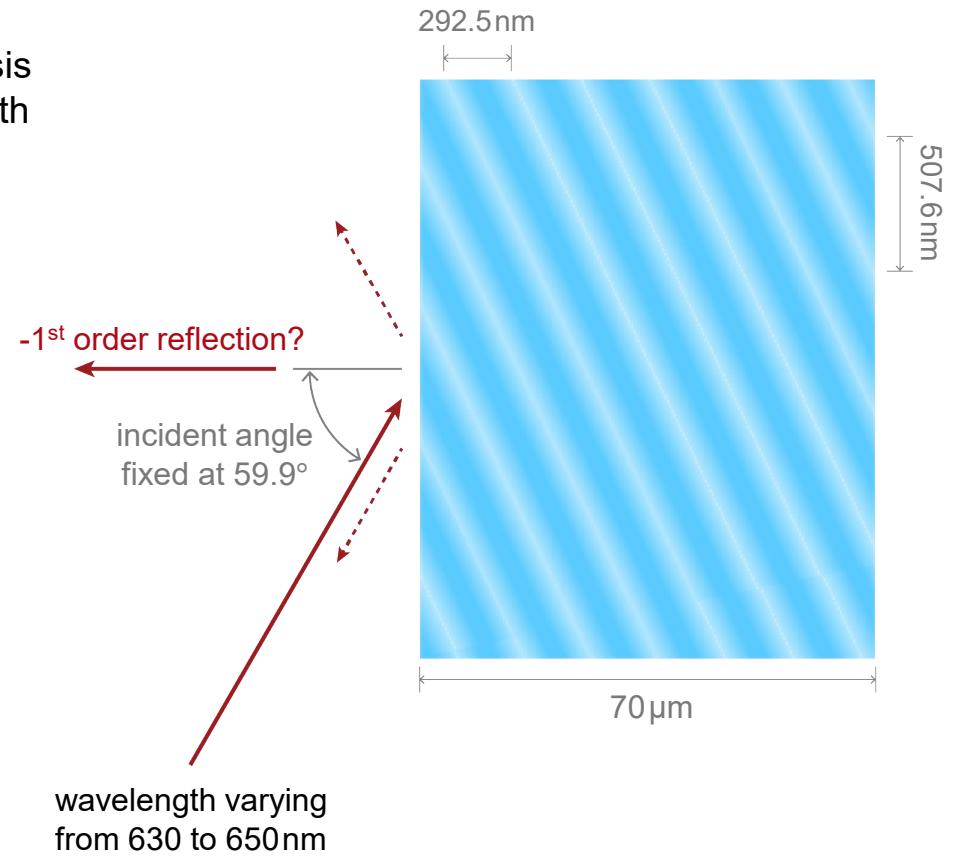
Modeling Task

z-period
292.5 nm

x-period
507.6 nm

0th reflection

-1st order reflection?

incident angle
around 60°
(to be varied)

-2nd reflection

input wavelength
around 640 nm
(to be varied)

holographic volume
grating generated by
two-beam interference
(640 μm, 59.9° angle)
exposure process, with
refractive index
modulation of 0.01
based on fused silica

thickness
70 μm

Diffraction Efficiency vs. Wavelength
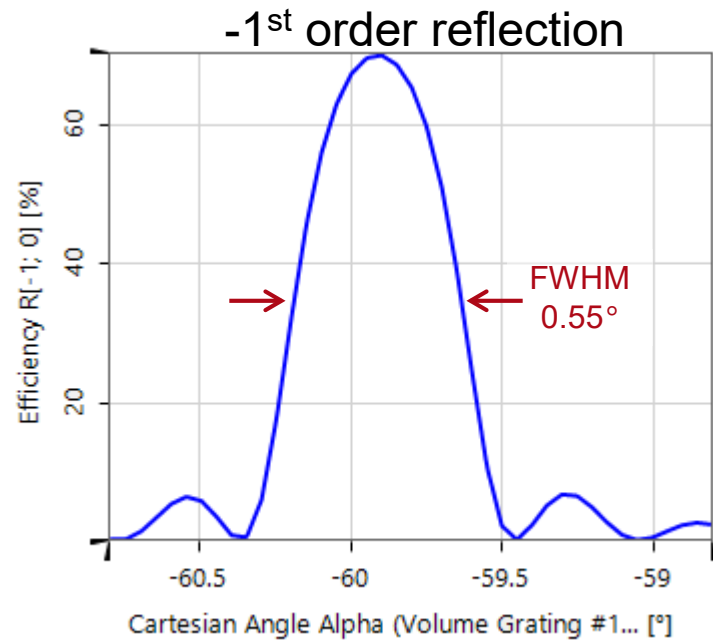

-1st order reflection

rigorous FMM analysis for varying wavelength

FWHM 3.45nm

shift of wavelength dependent reflection due to locally increased effective refraction index

292.5nm

507.6nm

-1st order reflection?

incident angle fixed at 59.9°

70μm

wavelength varying from 630 to 650nm

Diffraction Efficiency vs. Angle of Incidence

-1st order reflection

FWHM
0.55°

rigorous FMM analysis
for varying incident angle

292.5 nm

507.6 nm

70 µm

-1st order reflection?

angle varying
from 58.8 to 60.8°

wavelength
fixed at 644 nm
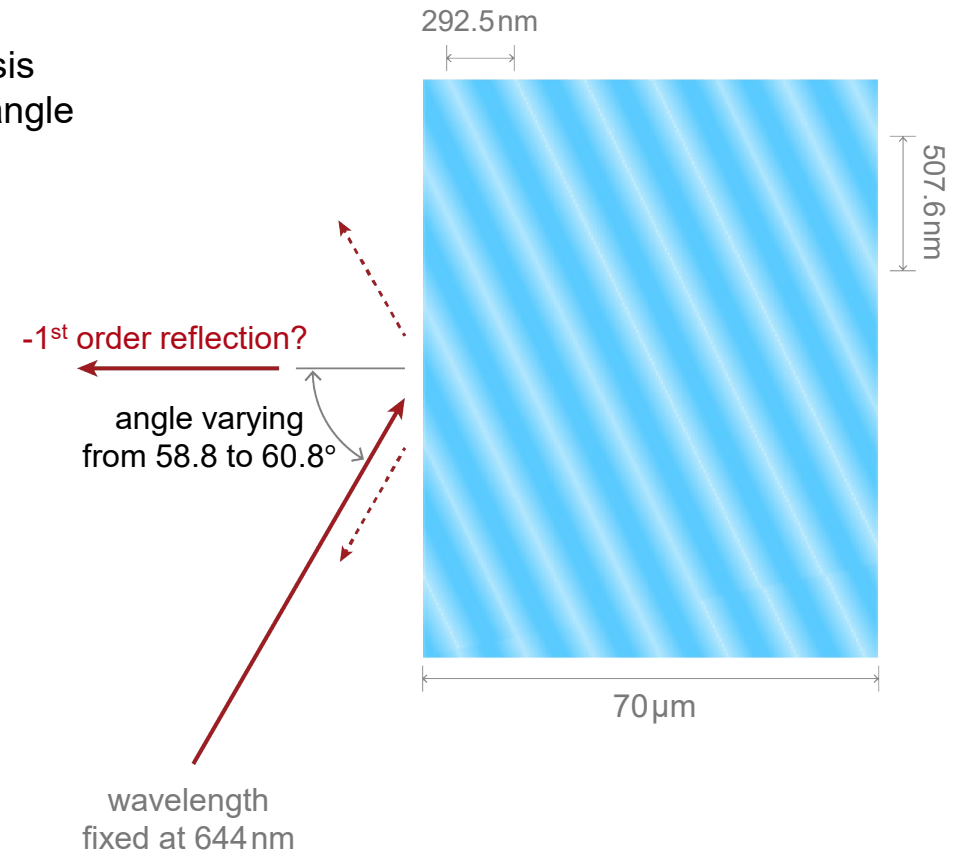
Document Information

title	Rigorous Simulation of Holographic Generated Volume Grating
document code	GRT.0003
version	1.1
toolbox(es)	Grating Toolbox
VL version used for simulations	7.5.0.158
category	Application Use Case
further reading	- Configuration of Grating Structures by Using Special Media