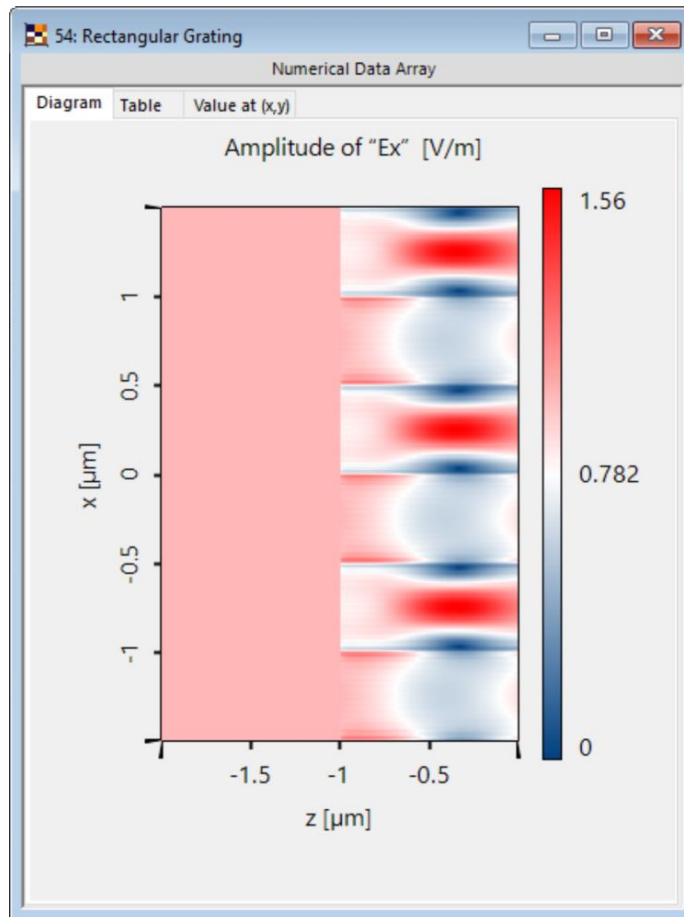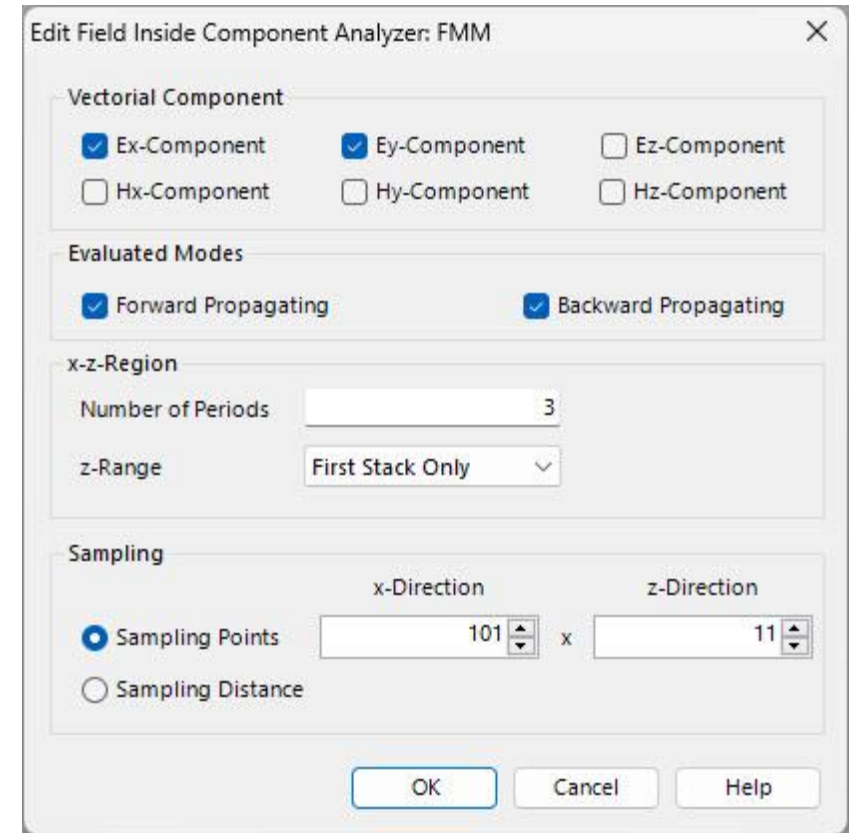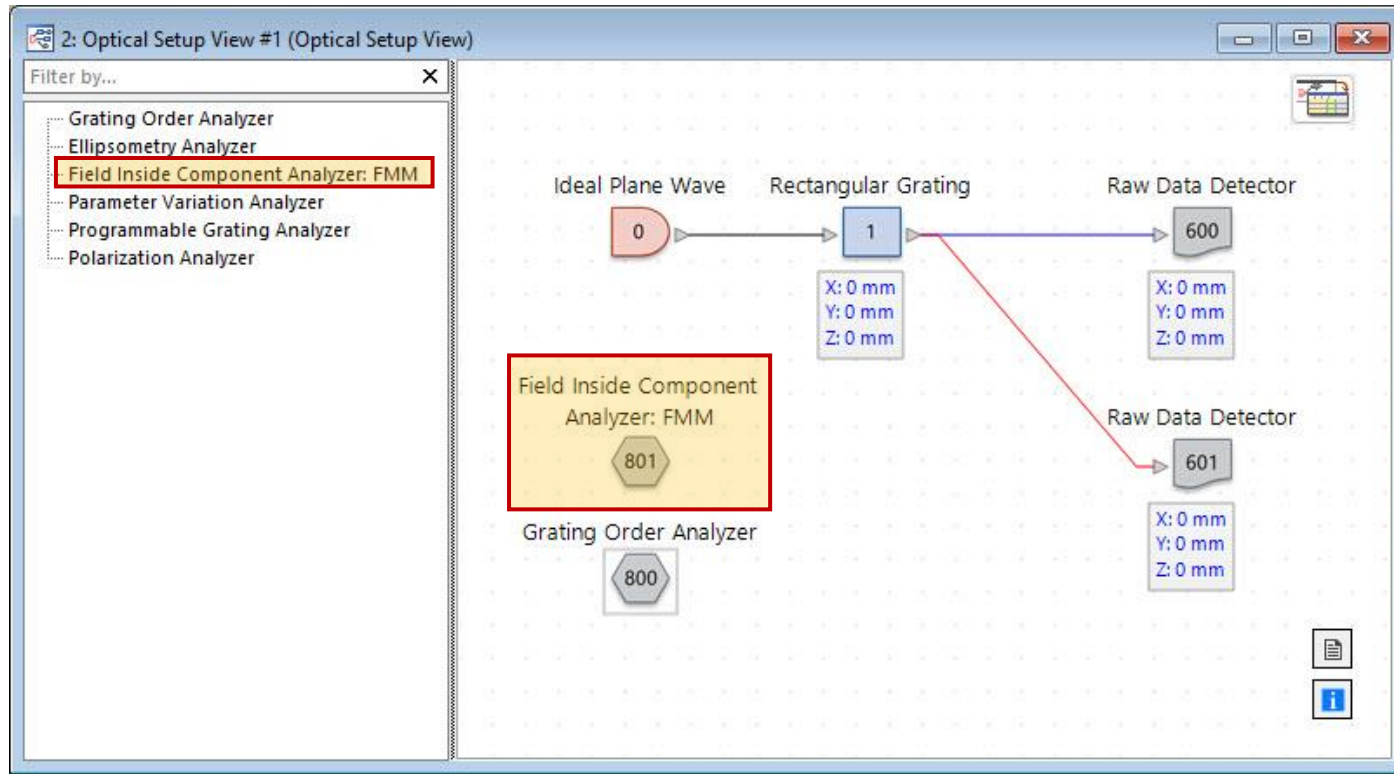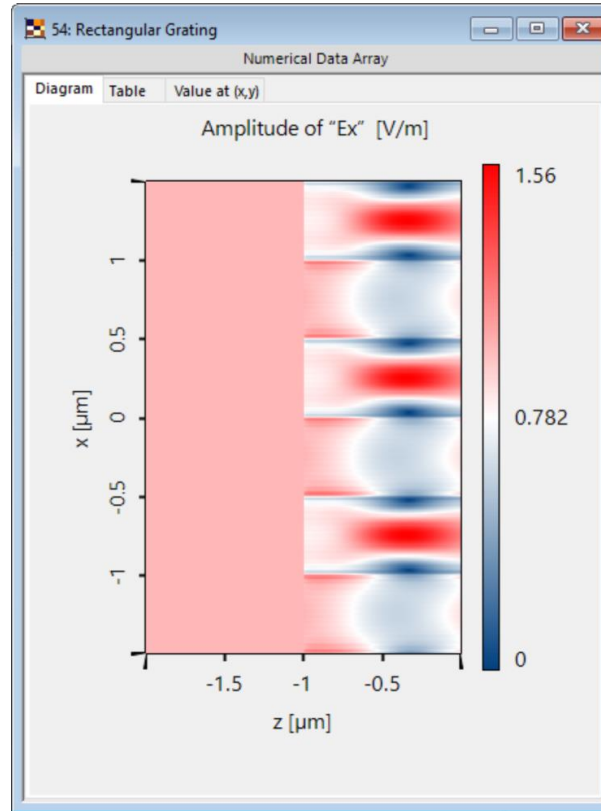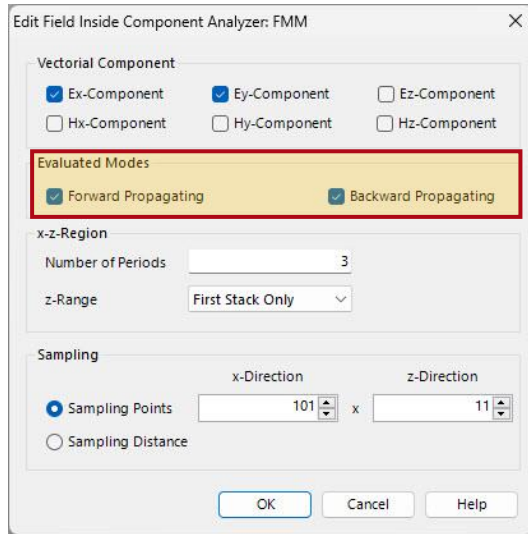# Field Inside Component Analyzer: FMM

Abstract

The Field Inside Component Analyzer: FMM allows the user to visualize and investigate the distribution of the electromagnetic field inside micro- and nanostructures. For this purpose, the field inside the periodic structure (transmissive or reflective, dielectric or metallic) is calculated with the Fourier modal method/rigorous coupled wave analysis (FMM/RCWA). It is also possible to specify which part of the field should be visualized: either forward modes, backward modes or both together.
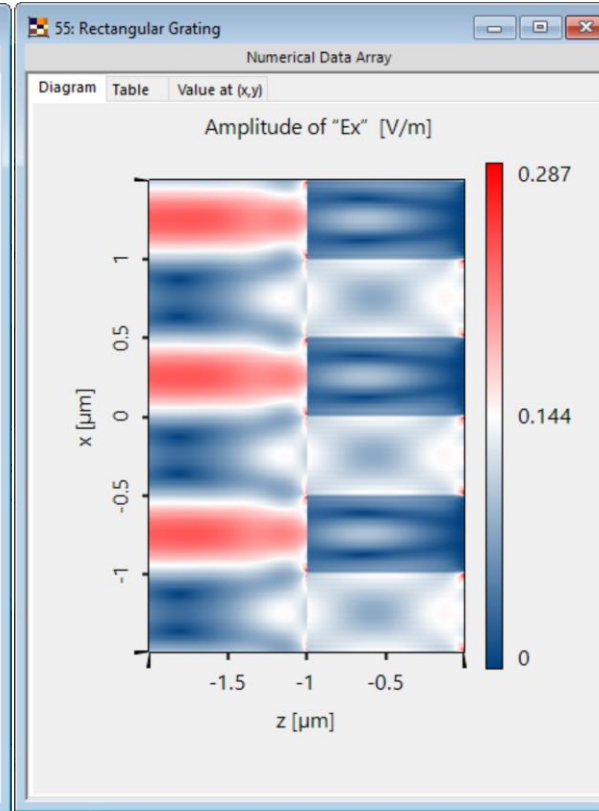
Field Inside Component Analyzer: FMM

The *Field Inside Component Analyzer: FMM* is an exclusive feature for *Grating Optical Setups* that provides a visualization of the electromagnetic field inside the grating structure.
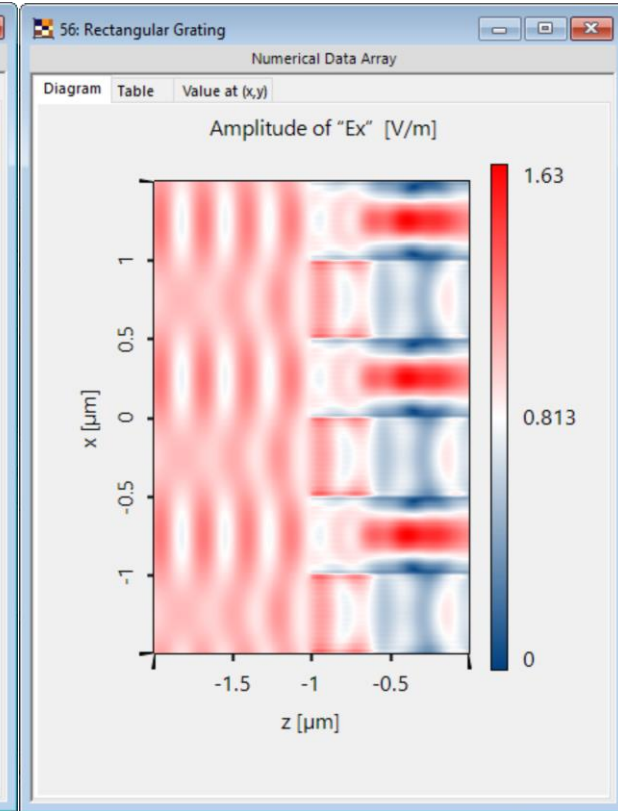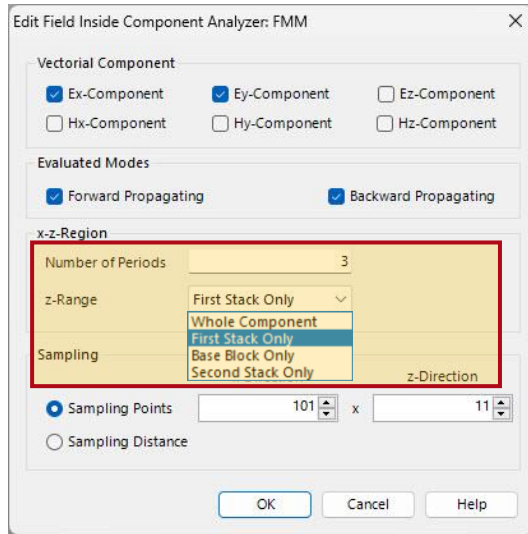
Selection of Evaluated Modes


In order to more easily distinguish between the incident, reflected and the transmitted fields, it is possible to evaluate only forward or backward propagating modes, or the sum of both.

forward propagating modes

backward propagating modes
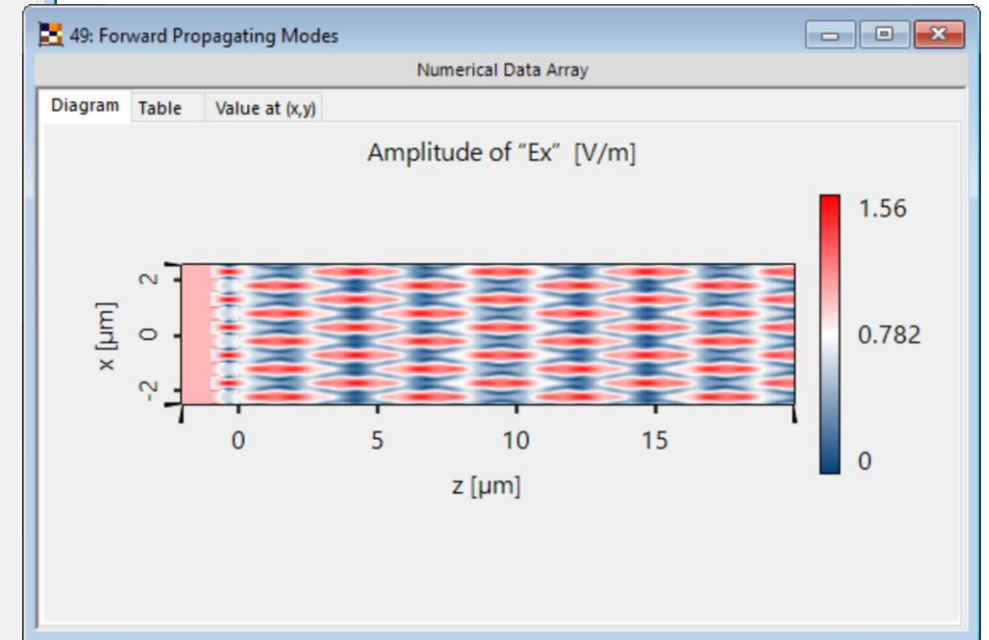
forward & backward propagating modes

Selection of Evaluated Region

The *Field Inside Component Analyzer: FMM* can output the field inside the whole component (including substrate) or alternatively only in one of the stacks or the base block (substrate).
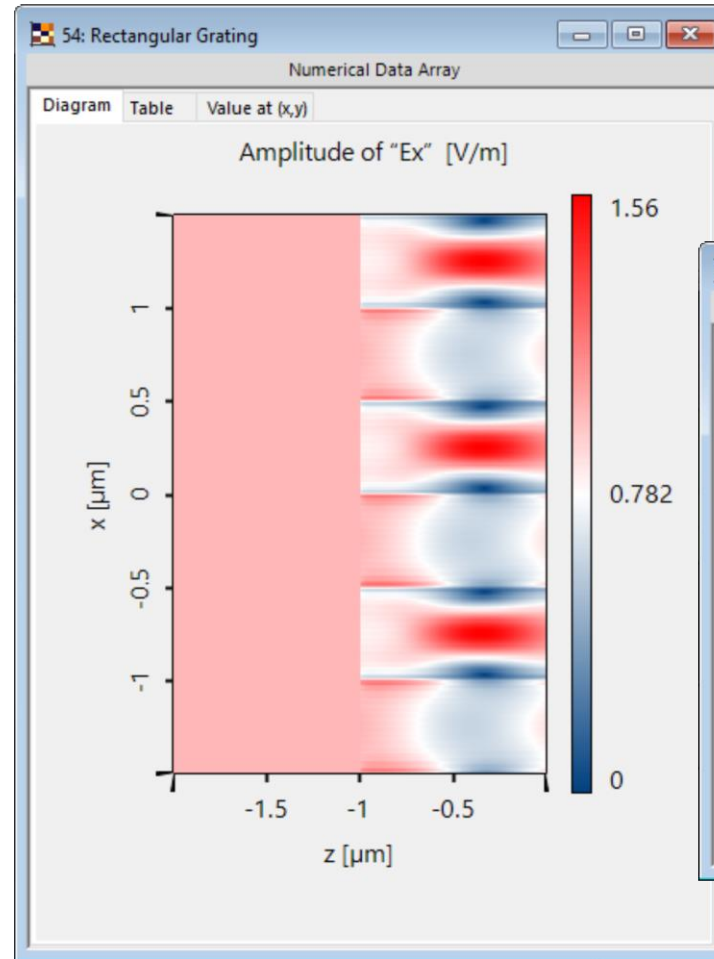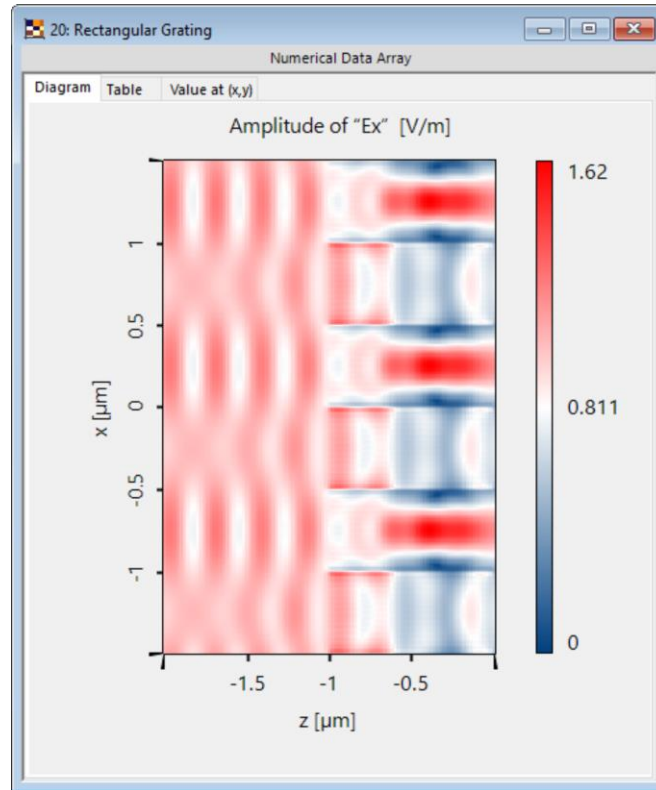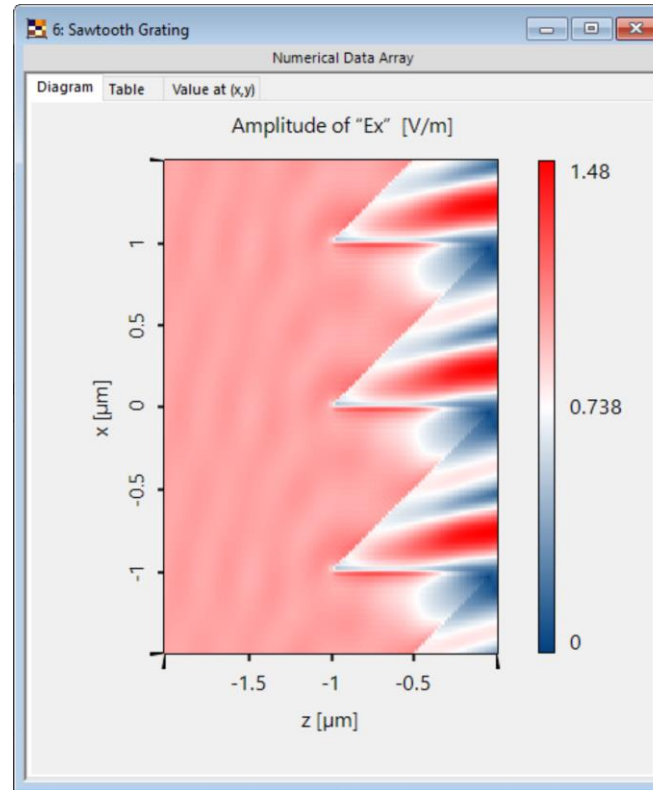
Evaluation of *First Stack Only*

Evaluation of *Whole Component* (here: stack and substrate)

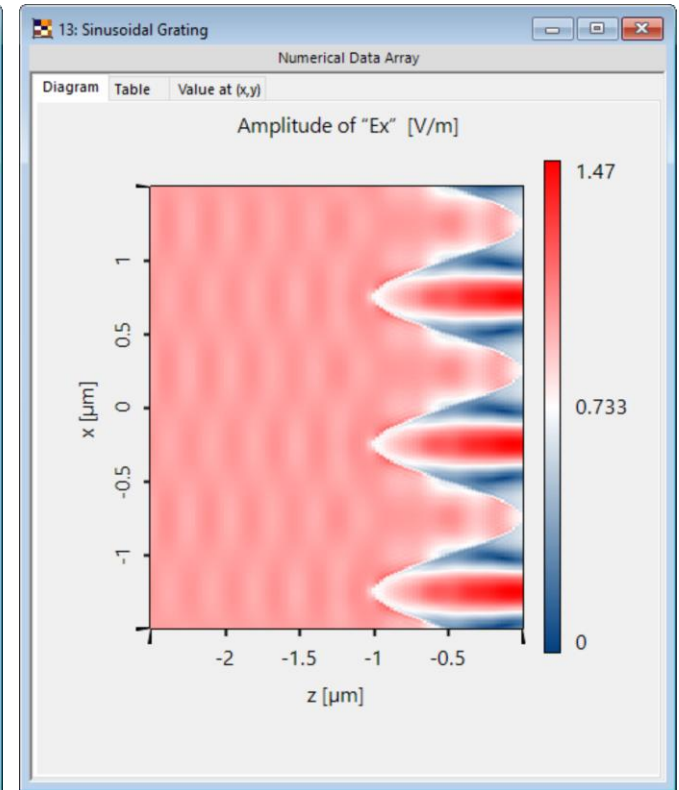# Field Distribution of Different Grating Structures

Arbitrarily shaped grating structures can be analyzed by the *Field Inside Component Analyzer*. Here are a few examples:
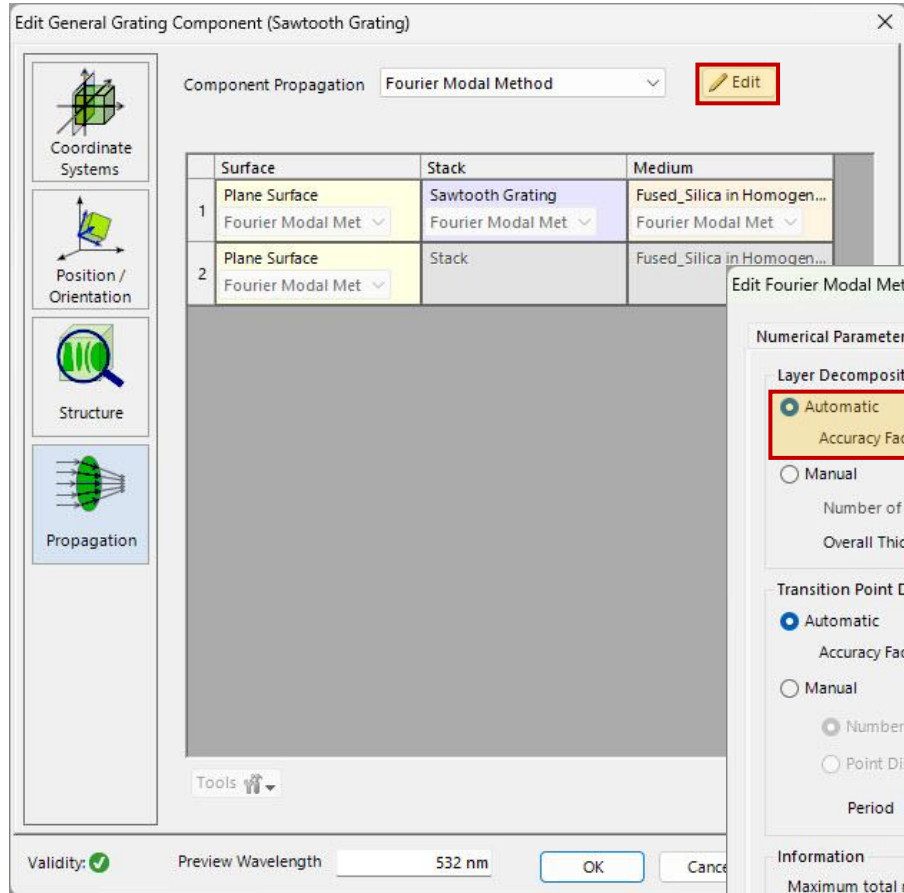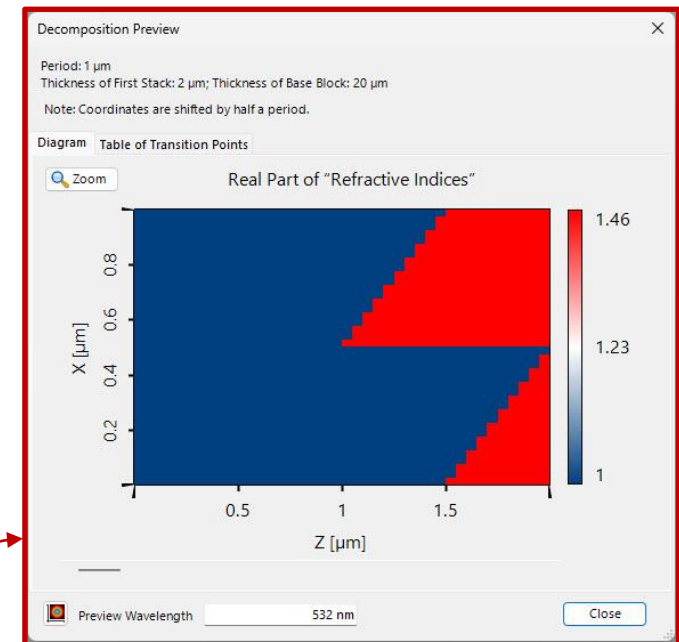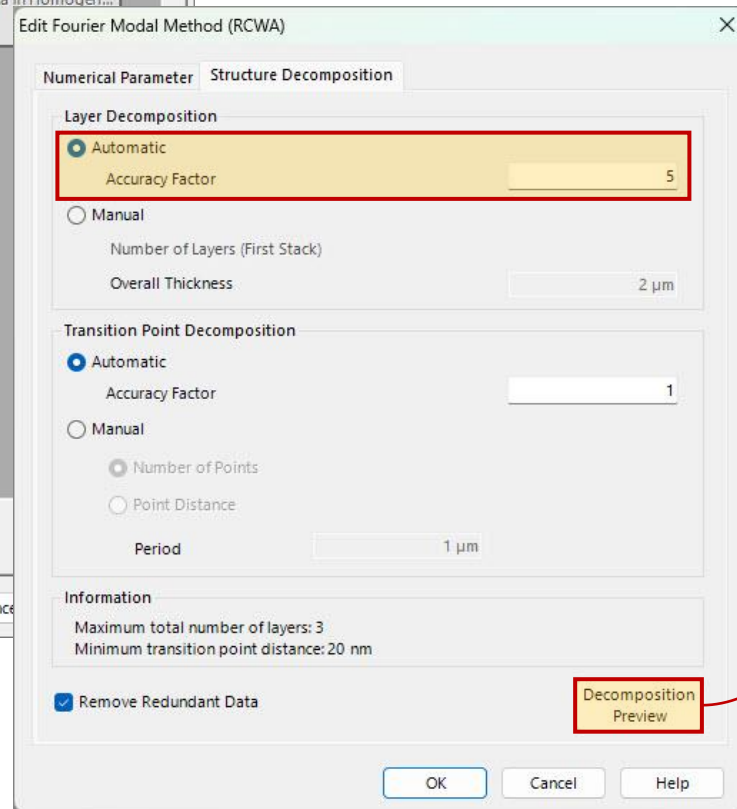

rectangular grating

sawtooth grating

sinusoidal grating

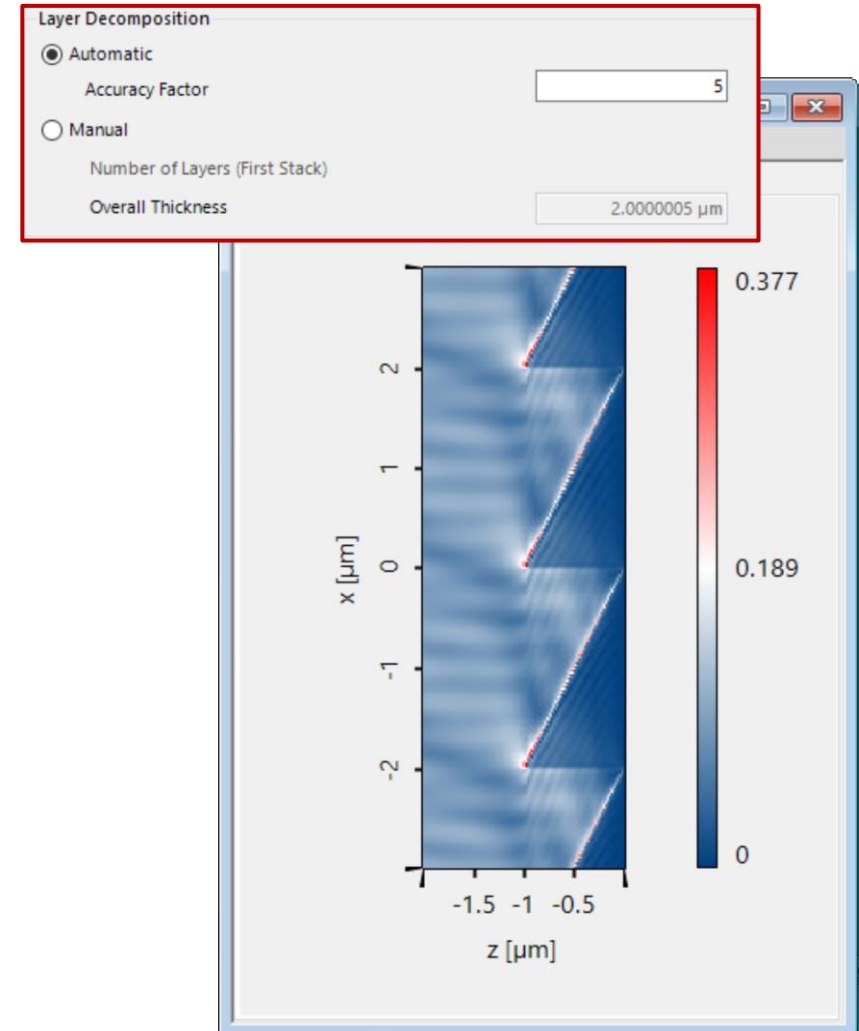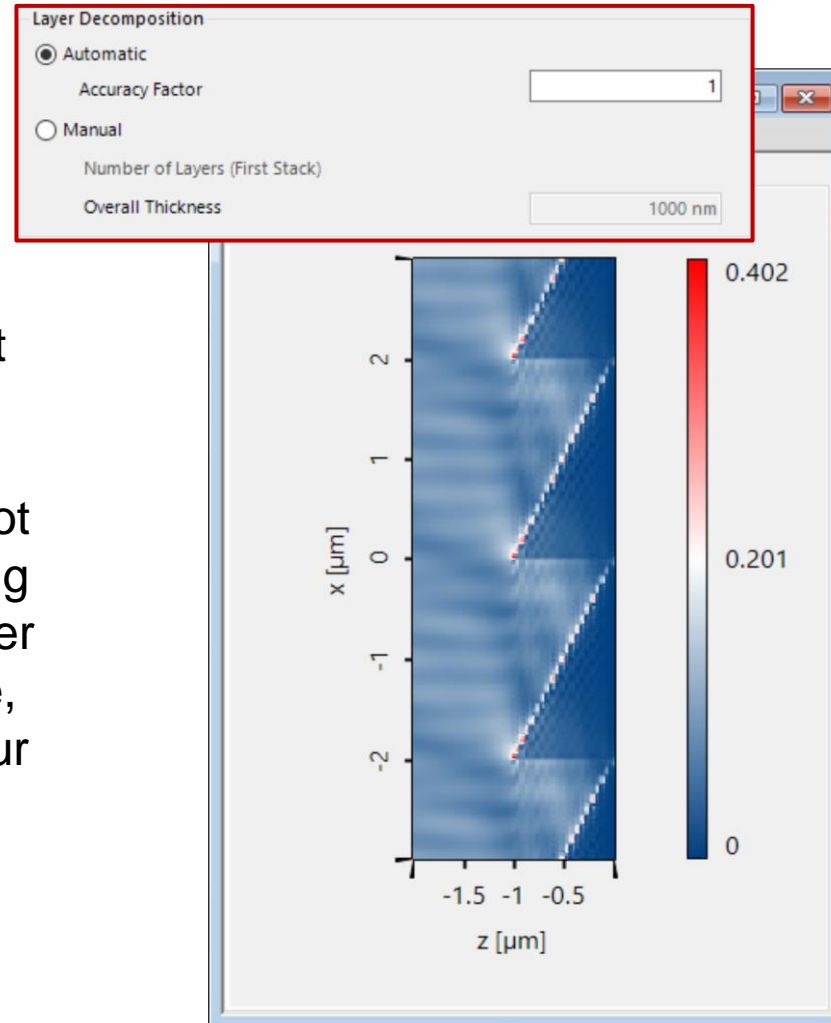# Sampling of the Grating Structure

While the analyzer provides a few sampling options for the output data, the grating surface defined in the system must be sampled properly (e.g. adequate number of layers for decomposition and transition points).

The *Decomposition Preview* exhibits how the grating structure will be sampled according to the current sampling factors.
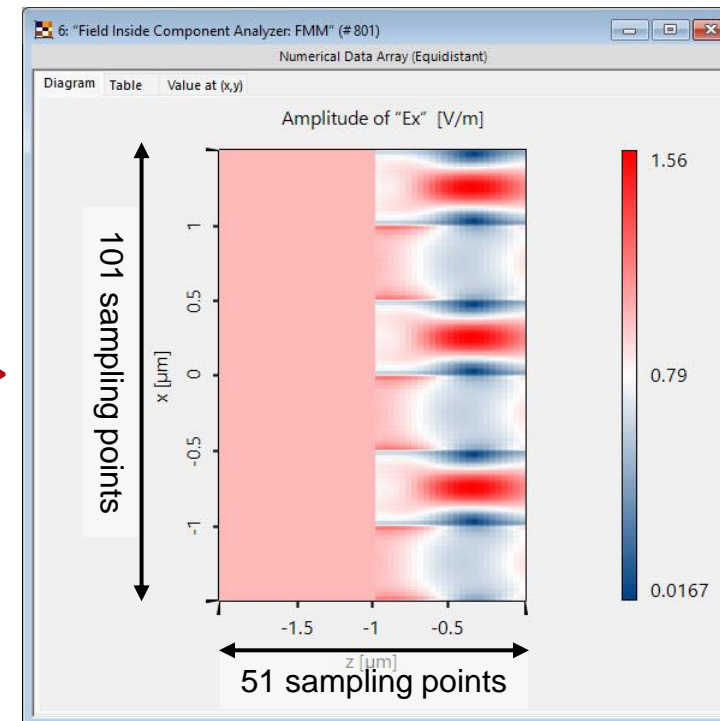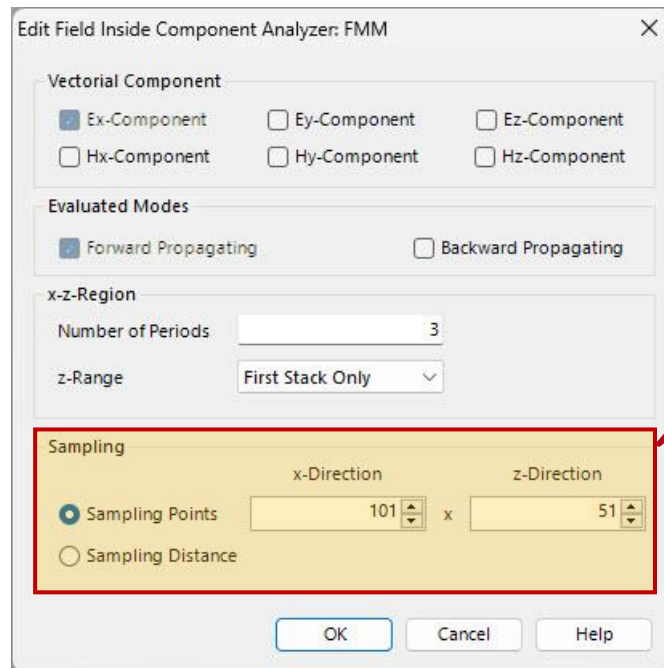
Sampling of the Grating Structure

Adequate sampling of the grating structure means that convergence has been achieved, i.e. that further increasing sampling does not noticeably affect the resulting field. For instance, if the layer decomposition is too coarse, additional effects might occur due to the large steps in the profile.
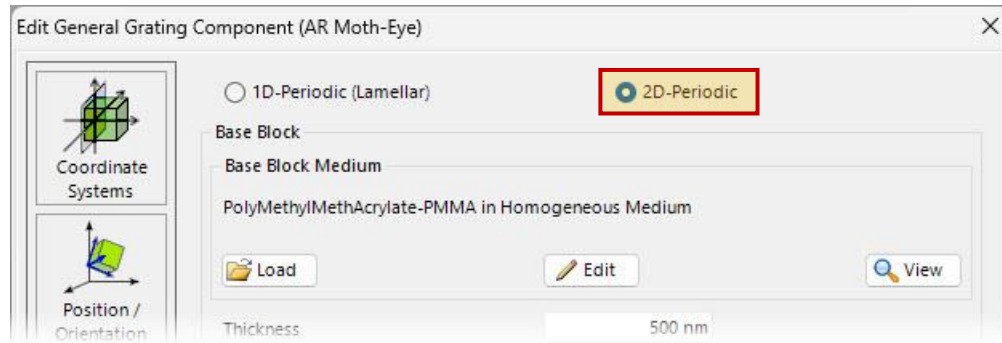
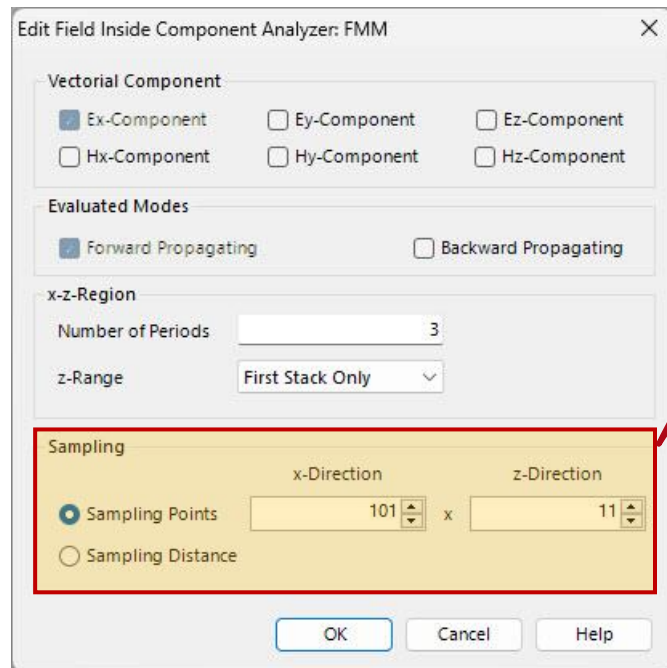# Sampling of the Output Data: 1D-Periodic Gratings (Lamellar)

For *1D-Periodic (Lamellar)* gratings, the analyzer generates a 2D cross-sectional image with the parameters specified in the *Sampling* section of the dialog.
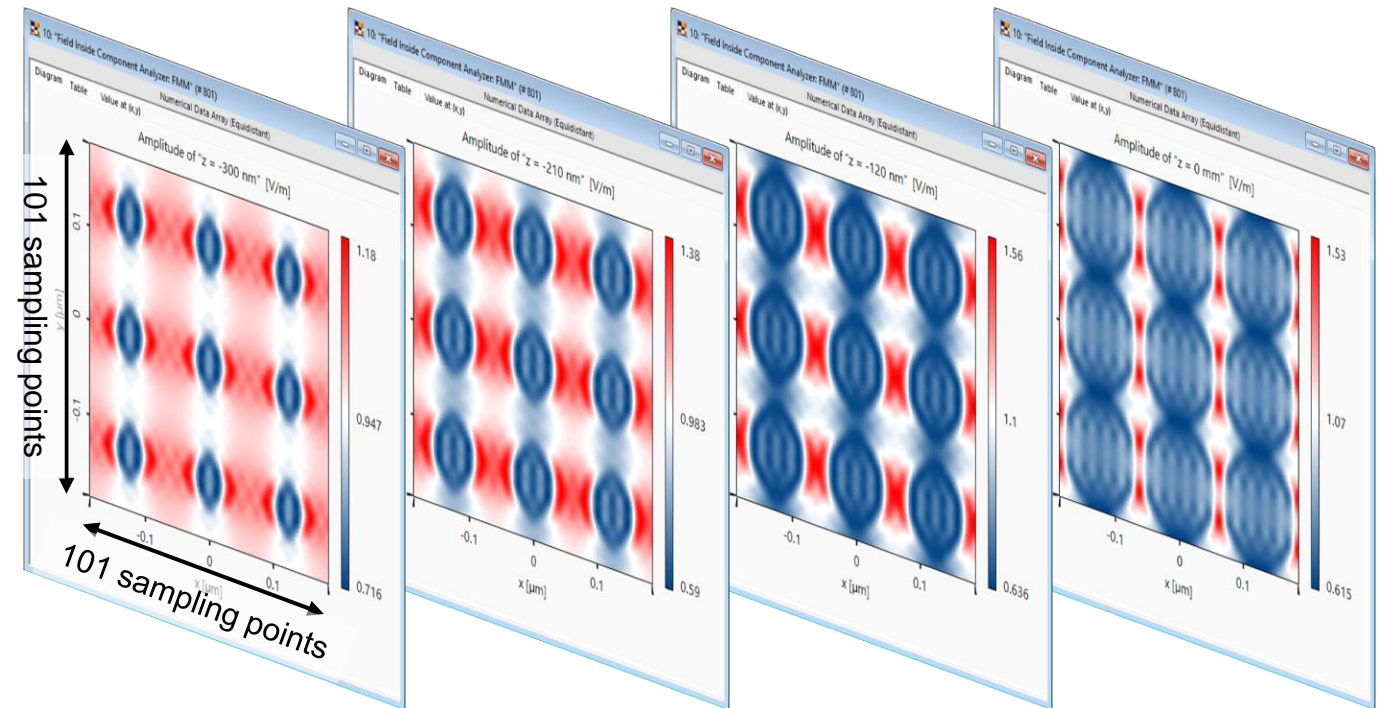
Sampling of the Output Data: 2D-Periodic Gratings

When the analyzed grating is set to *2D-Periodic*, the *Field Inside Component Analyzer: FMM*, will instead generate a series of quadratic cross-sections through the structure, with the sampling parameter in z-direction dictating the number of cuts performed.

Document Information

|	
title	Field Inside Component Analyzer: FMM
document code	SWF.0018
document version	2.0
software edition	• VirtualLab Fusion Standard • Grating Package
software version	2023.2 (Build 1.242)
category	Feature Use Case
further reading	• Ultra-Sparse Dielectric Nano-Wire Grid Polarizer • Rigorous Analysis and Design of Anti-Reflective Moth-Eye Structures • Thin Element Approximation (TEA) vs. Fourier Modal Method (FMM) for Grating Modeling • Configuration of Grating Structures by using special Media

Presearch

SWF.0018, Field Inside Analyzer, Field Inside, Inside Component, Inside, Internal, Internal Field, Analyzer, Field in Component, Grating, Grating Analyzer, FMM, Fourier Modal Method, RCWA, metallic, dielectric
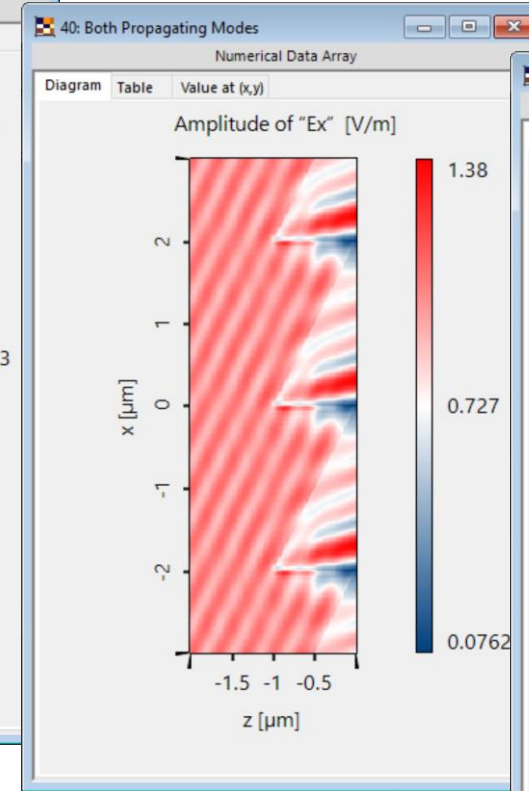
Short Abstract

This example demonstrate, how to calculate the distribution of the electromagnetic field inside a 1D or 2D-periodic micro- or nano structure.
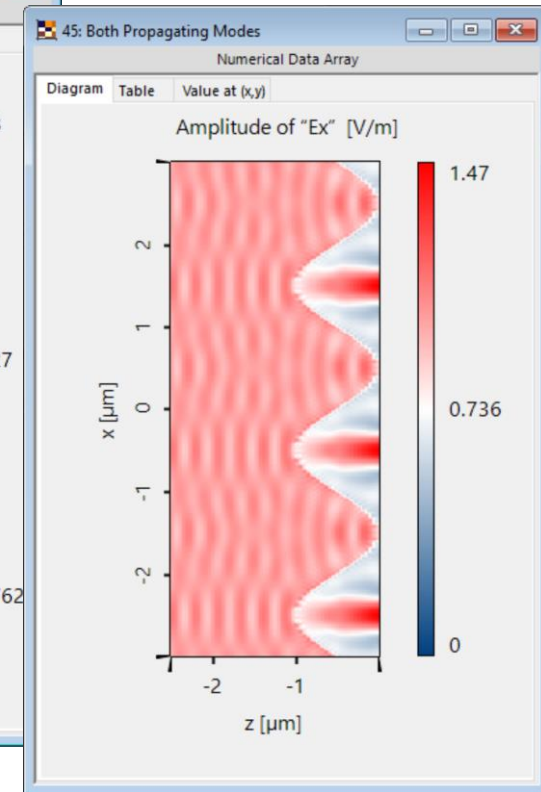
Marketing Picture
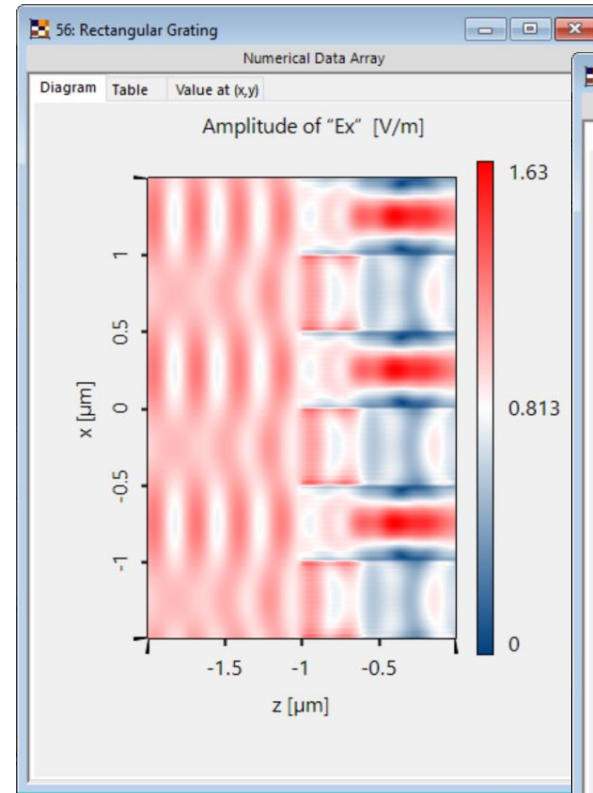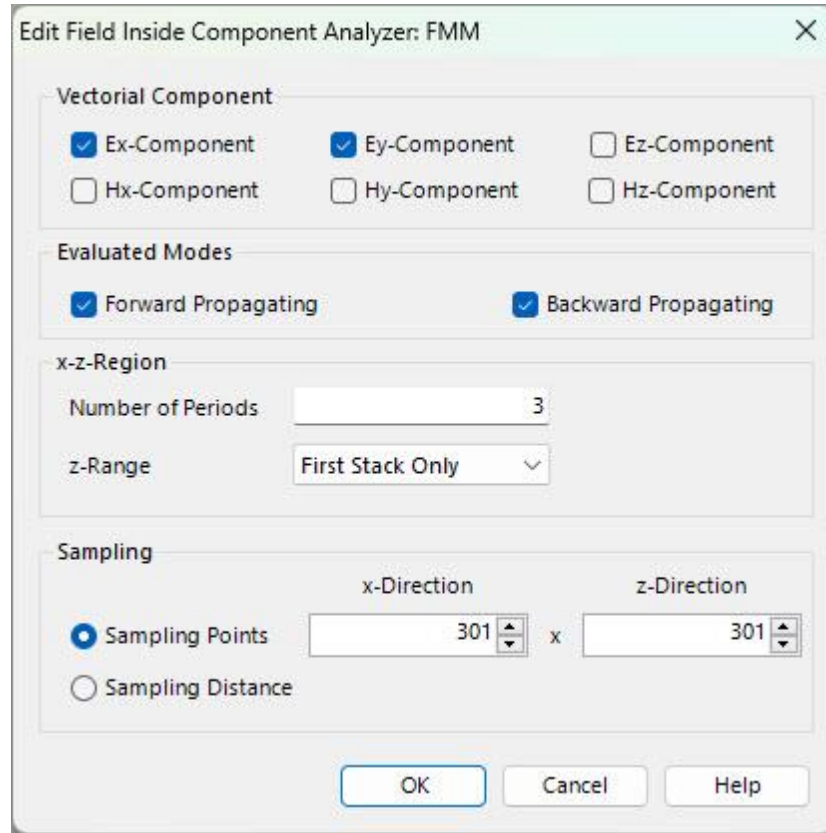
rectangular grating

blazed grating

sinusoidal grating