

# OptiGrating 4.2.3

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December 2014

## Overview

OptiGrating 4.2.3 is an update to OptiGrating 4.2.2. It presents fixes to issues and implements enhancements suggested in the time between these two releases.

## Summary of Enhancements

### BZ 4282 Sensors

OptiGrating has a sensors option available for 2 and 3 layer fibres. Problems were noted in the calculation of this effect. The source of the problem was inconsistencies in the interpretation of Average Index in the grating definition. To fix the problem, the definition of Average Index has been changed and applied consistently across the whole application. Please note this change in Average Index interpretation. The average index is now applied to the modal index of the simulation. It is like changing the index of every layer in the profile by the same amount. The Average Index value is set and controlled by the user in the Grating Definition dialog box. The software does not modify it. If a change to the average index within a single layer only (such as the fibre core) is desired, the Shape function should be modified so as to create a change in average index that is restricted to the photosensitive region.

### BZ 4284 Profile view is incorrect

The Profile view illustrates the change of index modulation over the length of the grating. It displays level of index modulation including apodization, and average index. However, the Profile view did not always display as expected. The Profile View consists of two curves defined over the length of the grating. Let  $Dn_0(z)$ ,  $Dn$ ,  $A(z)$  be Average Index, Index Modulation, and Apodization. Let  $f_{\min}$  and  $f_{\max}$  be the minimum and maximum values of the Shape function. Then the upper and lower curves should follow

$$Dn_0(z) + Dn * A(z) * f_{\min}$$

$$Dn_0(z) + Dn * A(z) * f_{\max}$$

The software was modified to display this way. Note this definition does not show photosensitivity or its effects. It is expected the user will normalize the maximum value of photosensitivity to 1, and the plot shows the index modulation for that case.



### **G-3 Cannot read one column data in the grating "Shape"**

When reading the Shape function in from a data file, the external data file contains either one or two columns of numbers in text format, separated by a comma or a space.

**Two Columns** - If the file has two columns, the first column is the position along the grating length (for Average Index, Period Chirp, and Apodization) or the position along a single period (For Grating Shape). The second column is the defined Grating Shape, Average Index, Period Chirp, or Apodization value.

**One Column** – In this case, the column is the defined Grating Shape, Average Index, Period Chirp, or Apodization value. It is assumed that the data are uniformly distributed on the X axis.

In the case of Grating Shape, if the data was in One Column format, it was not read correctly. This problem has now been fixed.

### **BZ 4229 Simulation with multimode sensors has inconsistent results**

In a long period grating with sensors and many modes selected, the application was giving incorrect or inconsistent results. Pressing Calculate twice could give different results.

The problem was traced to an error in the calculation of array index. The array index caused data from outside the array boundary to be read and used in the calculation. The inconsistent results came from the uncontrolled data outside the array. The array index has been corrected and the problem is now fixed.

### **G-2 Typo in the Mouseover box**

A typo in the Grating Manager dialog box has been corrected.

### **BZ 4062 Units incorrect in Tools Group Delay dialog box**

The Group Delay dialog box in Tools >> Group Delay does a power series curve fitting of delay in ps. The terms are labelled ps, ps/um, ps/um<sup>2</sup>. However, any example shows this is ps/nm, not ps/um. The algorithm was also examined, and it was confirmed the spectral unit is nm. The labels have been corrected.



# OptiGrating 4.2.2

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June 2008

## Overview

OptiGrating 4.2.2 , released as an update to OptiGrating 4.2.1, fixes issues and implements enhancements suggested in the time between these two releases.

## Summary of Enhancements

### **2812 Better description of the Average Index.**

The average index is defined by equation (15) in the Technical Background chapter of the manual. The definition in the manual is confusing in the case of Average Index, as equation (15) applies to the grating only, and not to the waveguide as a whole. Added helpful suggestion near equation (15) in the manual.

### **3984 Documentation for Other Waveguide**

The documentation of Other Waveguide needs more detail in the definition of Overlap Integral in the Input Mode panel and in the Mode List. More detail has been added in the manual.

### **3668 Permit Entry of Central Wavelength in Other Waveguide Project**

Now the data can be entered in the Grating Definition dialog box in the case of Other Waveguide Project. Once entered, the Central Wavelength is also displayed in the main window.

### **3736 Remove Restriction on Refractive Index of Fibre**

Allow entering a value of real part of refractive index less than one.

### **3933 Out of memory trouble on dispersion enabled multimode scan**

This trouble starts when the selected modes don't exist for every wavelength. Most cases will run without error, but if there are fewer than 2 data points with all modes existing, the projects could finish with an "Out of Memory" message. The problem has been fixed.

### **4043 Waveguide modesolver has wrong X axis**



The Waveguide Module has a mode solver for 2D modes. The mode can be viewed after solving, but the X axis of that graph is wrongly labelled. The exported graph X axis is also wrong. The problem has been fixed.

**3370 Phase Shift Radio Button selection not working properly**

The Radio Button in the Phase Shift dialog box of the Grating Manager sometimes doesn't show the ON dot in the radio button. The problem has been fixed.

**4032 Uniform Micro strain constant not remembered by dialog box**

In the Sensors definition, 2 Layer fibres open the Fiber Bragg Grating Sensor dialog box, and 3 layer fibres open the Long Period Grating Sensor dialog box. The Uniform option of the micro strain panel does not keep the constant. The problem has been fixed.

**2889 Fiber Bragg Grating Sensor box does not remember value in field**

Fiber Bragg Grating Sensor dialog box should hold the temperature of the grating. The problem has been fixed.

**3680 Strain Optic option of Fibre Sensors crashes OptiGrating**

For a long time we used a workaround for this trouble, since the Long Period Grating Sensors feature is identical to the Fiber Bragg Grating Sensor, except that the former permits different strain-optic parameters to be entered for the cladding and substrate. In this release the original trouble is also fixed, making the workaround unnecessary.

**2994 Profile tab graph has wrong amplitude**

For a grating with more than one grating in the Grating Manager with different index modulations, the Profile does not display the correct amplitudes for the separate gratings, even though the calculated result is still correct. The display problem has been fixed.

**Known Issue**

When OptiGrating is started with Remote Desktop, the colours that indicate local period in the Profile tab will not appear. The problem does not appear when OptiGrating is accessed remotely with Remote Desktop, but only if the instance of OptiGrating was originally opened locally.



# OptiGrating 4.2.1

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July 2004

## Overview

OptiGrating 4.2.1 was released as an update to OptiGrating 4.2. Before this update, the software used to apply restrictions to refractive index input, not permitting values of refractive index less than one. This restriction was in place to help a user who enters bad data by accident. Since the release of 4.2, the modeling of Surface Plasmons with metal layers in planar waveguides has become more common. The Cauchy Integral based mode solver of OptiGrating is ideally suited to the solving of these complex modes. Therefore OptiGrating 4.2.1 was released to allow input of refractive index of typical metals, often having a real part of refractive index less than unity. In OptiGrating 4.2.1, the restriction on entry value of refractive index of layers was removed and the mode solver was tested to confirm correct results for finding modes with Surface Plasmons. The user might be interested to reproduce this text book example of a Surface Plasmon using OptiGrating 4.2.1

### Surface plasmon example: Air-silver interface

$\lambda = .6328 \text{ um TM}$

silver,  $n = 0.067 - j4.05$

According to the reference, the surface plasmon should have modal index\*

$1.032 - j 0.0011$

In setting up the OptiGrating example, note that OptiGrating still requires at least 3 layers in the waveguide. This can be accommodated by letting either the silver or air layer consist of two identical layers. The result from OptiGrating is

TM(0)  $1.0319225 - j 0.0011076801$

Reference: "Optical Waves in Layered Media", page 336

Pochi Yeh

(John Wiley, New York, 1988)

QC176.8.O6Y45 1988

ISBN 0-471-82866 -1

\*Note the  $1/2$  in the definition of alpha in eqn (11.4-10)



# OptiGrating 4.2

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March 2003

## Overview

OptiGrating version 4.2 is the new, enhanced release of the market-leading Optiwave product, IFO\_Gratings 4.0. It addresses several key issues that Optiwave has become aware of based on feedback received from our valued customers.

## Summary of enhancements

### Import/Export of Apodization Function

When asked to export Apodization, OptiGrating would actually return not just  $A(z)$  in Equation 15 of the User's Reference manual, but  $n \cdot A(z)$ . This is the envelope of the Profile, and not, strictly speaking, the Apodization as defined in Equation 15. This has been adjusted. In OptiGrating 4.2, both import and export of Apodization function will work on the actual  $A(z)$ .

### Loading an Index Profile

In the Profiles dialog box, the button that enabled input from a data file was not functional. It has been implemented for 4.2.

### Using SCAN parameter in Sensors tab

In the Fiber Bragg Grating Sensor user-defined dialog box, there are user-defined functions. The SCAN variable is now available in the dialog box in order to enable the scan of micro-strain.

### File name on Title bar

Occasionally, when switching amongst the tab views in the main window, the File name would disappear from the Title bar. The File name now consistently appears in the Title bar.

### Axes Labels on Graphs associated with the Inverse Scattering Solver

Some graphs associated with the inverse scattering solver had ambiguous labels on the axes. This labeling has been clarified.

