

**PCGrate v. 6. 7. 1.**

**International intellectual Group Inc. (I. I. G., Inc.)**

**Is a world leader in modeling of the diffraction gratings efficiency for spectroscopy, astronomy, telecommunications, photolithography, and nanotechnology.**

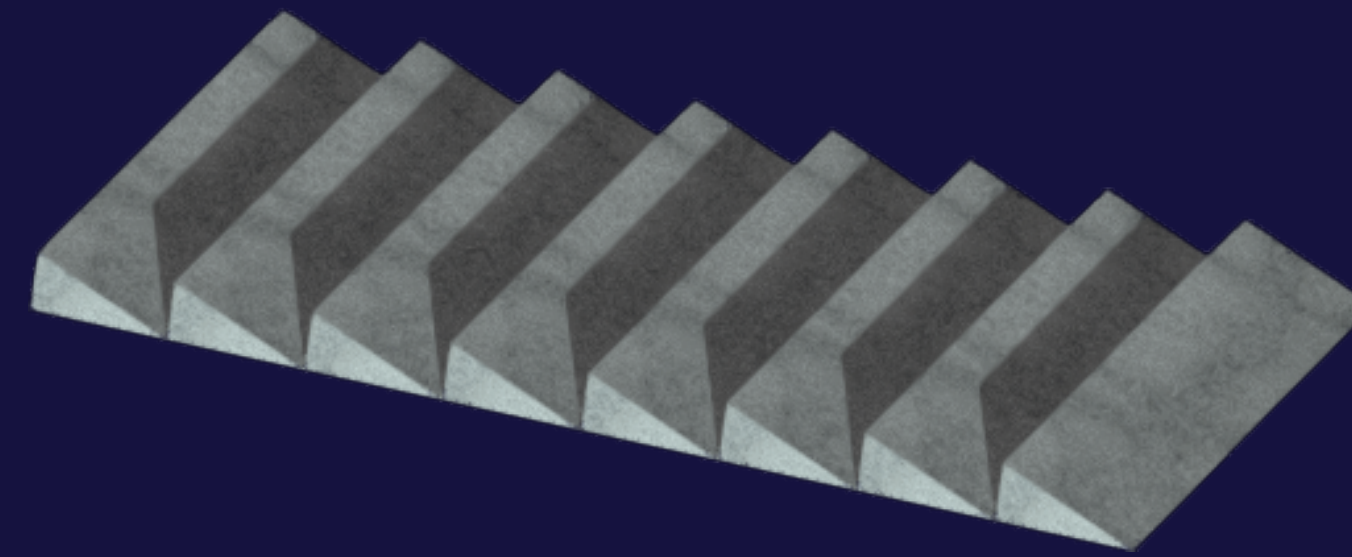
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pcgrate.com

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# PCGrate<sup>®</sup> Software Worldwide

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- ✦ **PCGrate<sup>®</sup> Distributors**



Since our commercial debut, we sold more than 500 packages to recognized governmental & military laboratories, private companies, universities and research centers.

# Company History

Our company has a lot of experience in modeling the efficiency of different types of relief and phase gratings. Our 30-year success was the creation of PCGrate<sup>®</sup>, a tool for analysis and optimization of absolute diffraction gratings efficiency by an accurate boundary integral equation method. The development of such software was possible with the collaboration of experts in physics, mathematics, and computer science. Our team has been working with world-leading manufacturers of ruled and holographic diffraction gratings, as well as with governmental labs and private companies. The PCGrate team was the first to create a PC-oriented software for exact analysis and optimization of relief and phase gratings efficiency. In 1989, the first PCGrate worked well under DOS on a PC/AT (or even XT!) with only 640 KB RAM.

Today optical engineers and scientists all over the world make use of PCGrate<sup>®</sup>-S(X) codes as a research tool to simulate spectroscopic and micro/nano-electronic & photonic systems.

# Company History

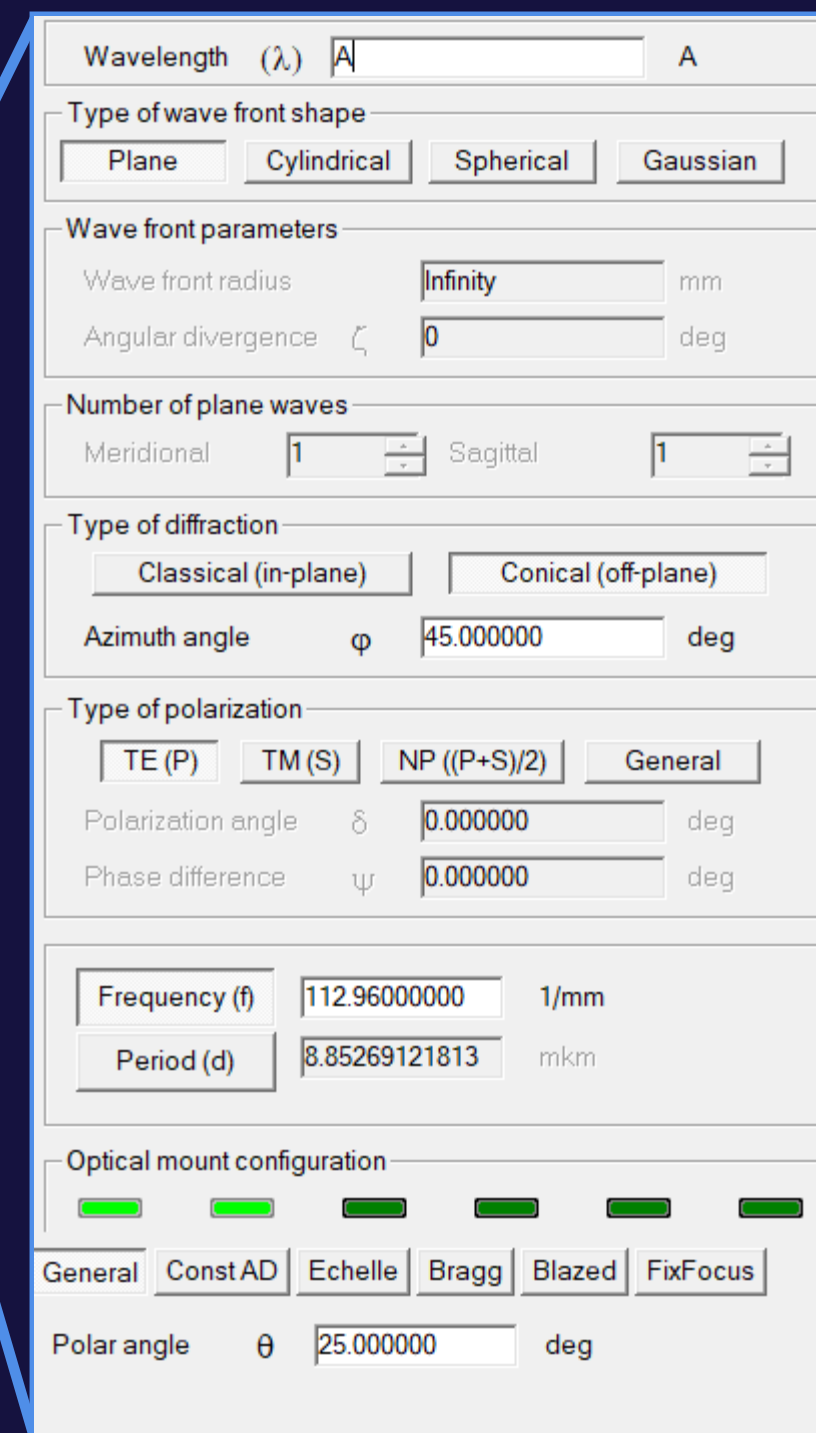
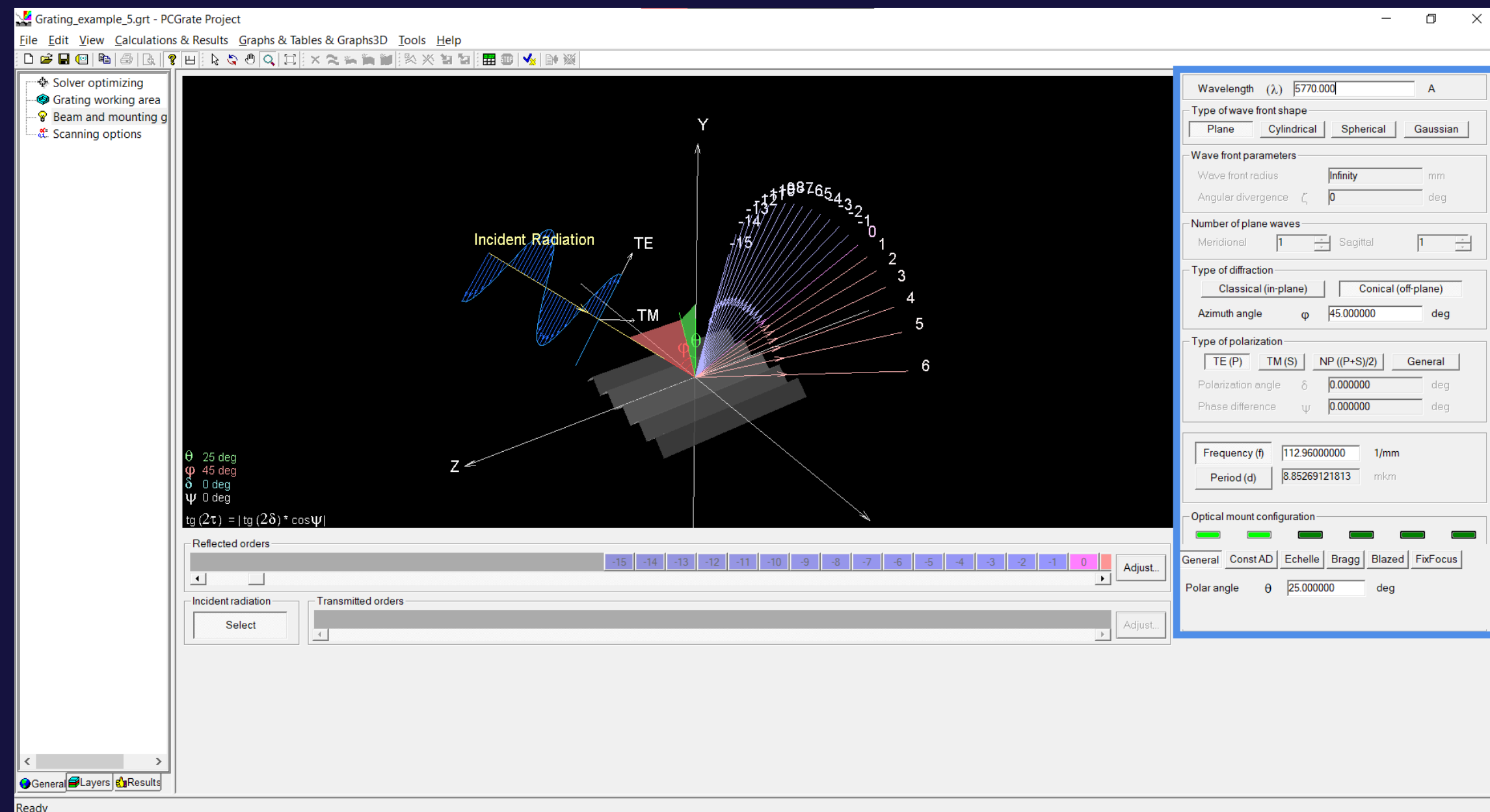
Our specialists live in different countries and cooperate internationally. We do distributed project development online and outsource some R&D to reputable companies. We welcome any questions or proposals related to our research and software development. Our experts participate in various conferences/projects and publish many articles in respected journals.

The prime object of our activity is to bridge the gap between theory and experiment for all types of gratings, and to provide researchers with more versatile tools and methods for increasing performance of the next generation of photonics devices. That also becomes possible owing to our collaborators from:

- ✦ NASA GSFC;
- ✦ NRL Space Science Division;
- ✦ Richardson Gratings of Newport Corp.;
- ✦ Laurence Berkeley National Laboratory.



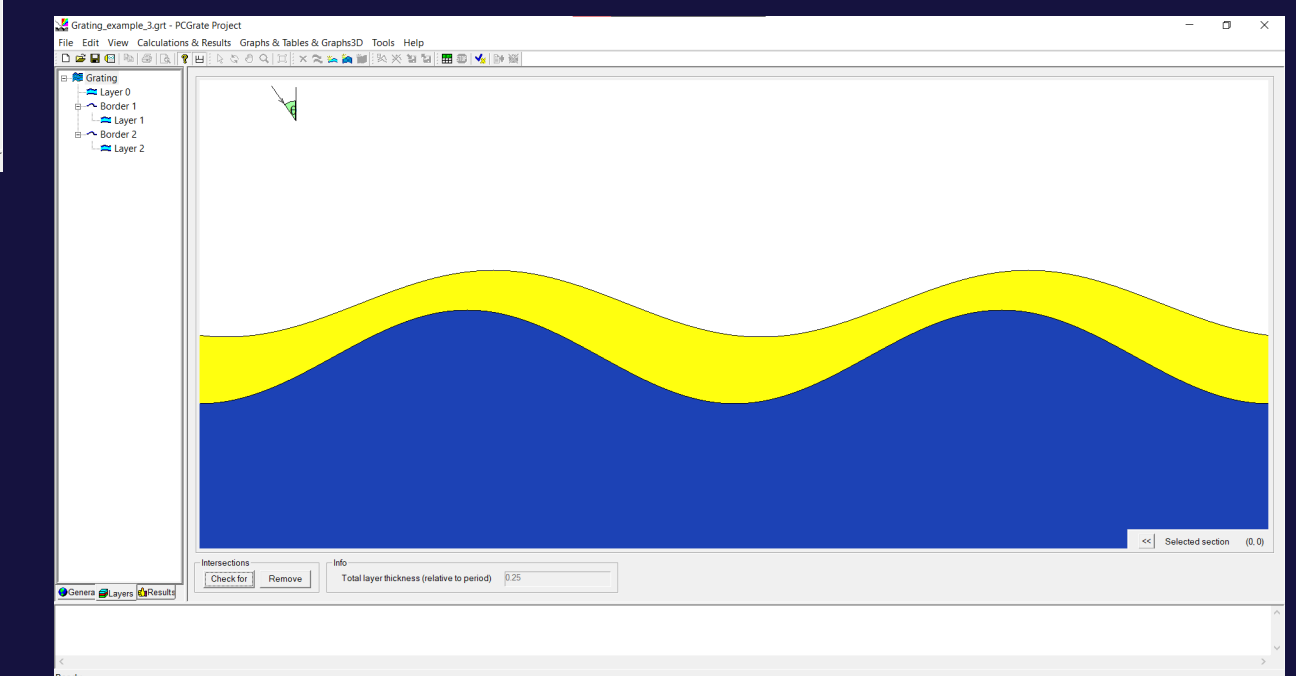
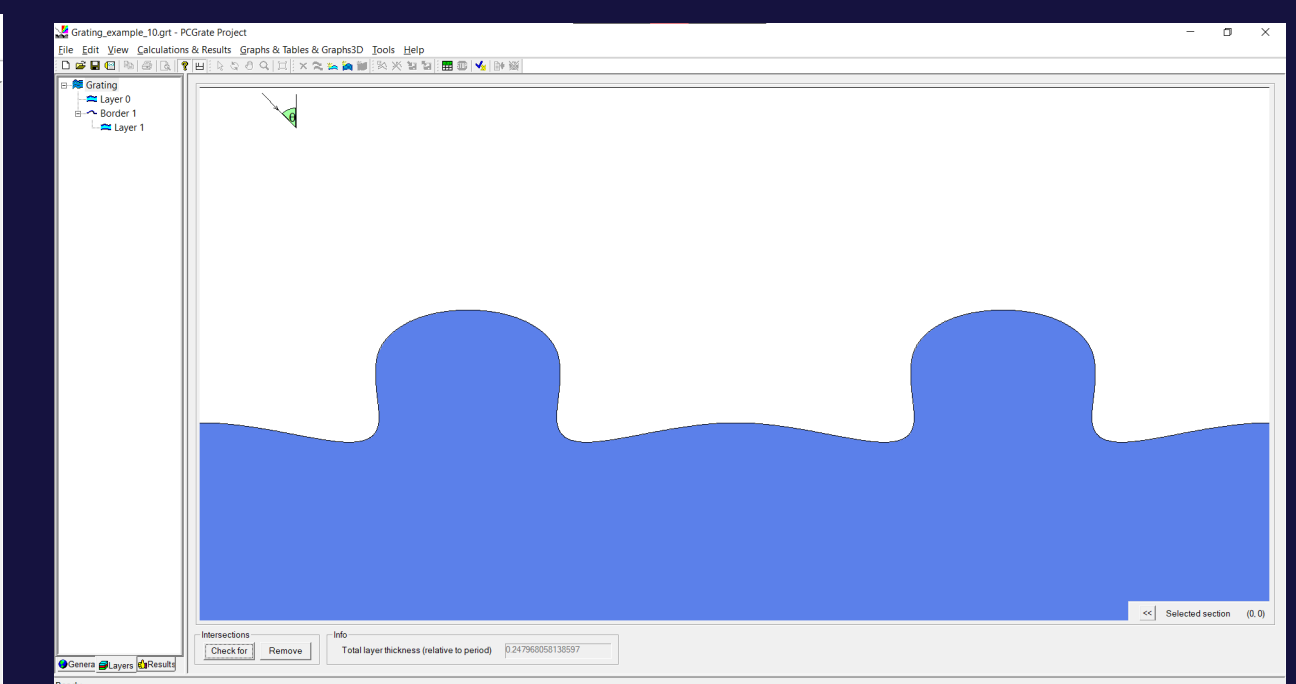
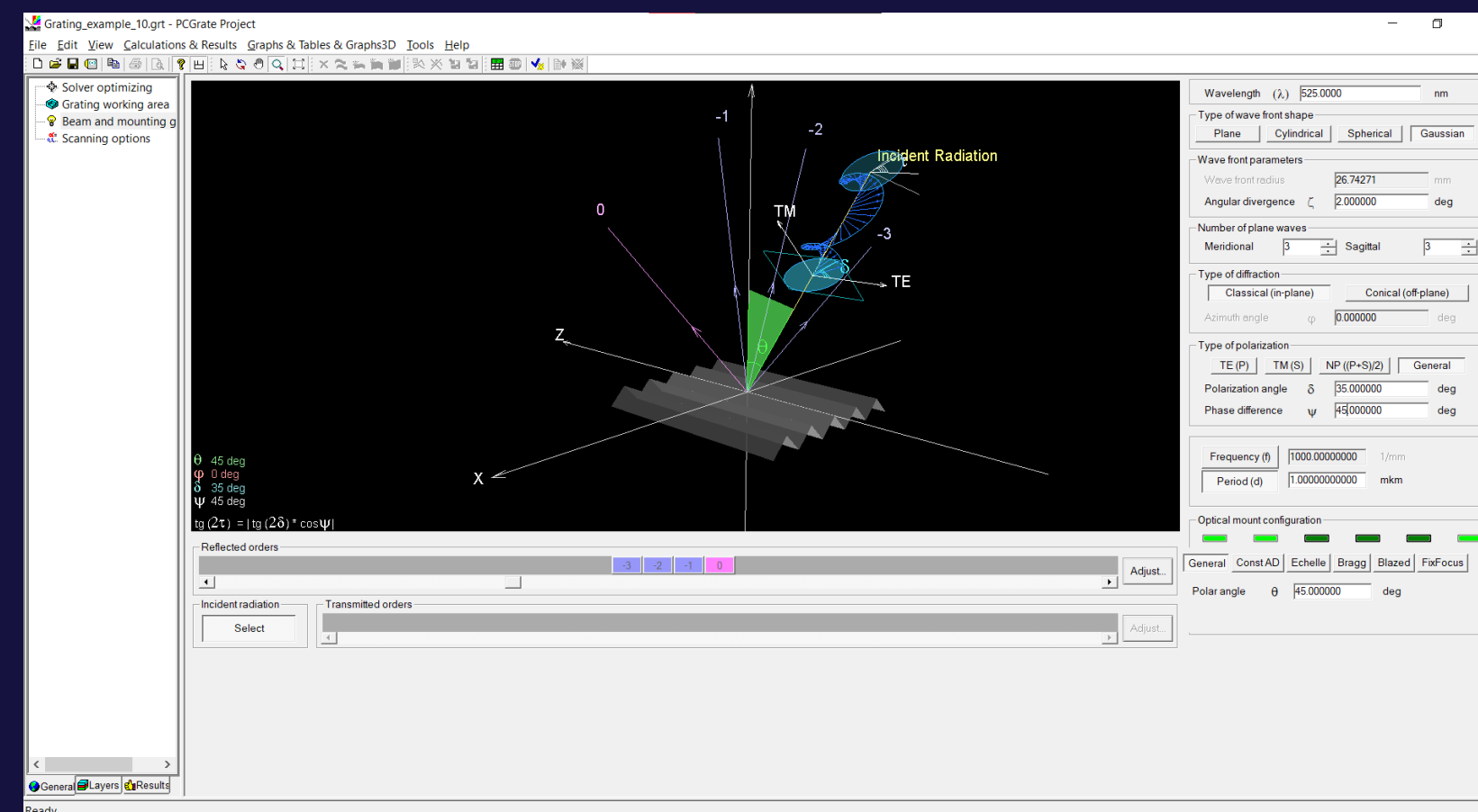
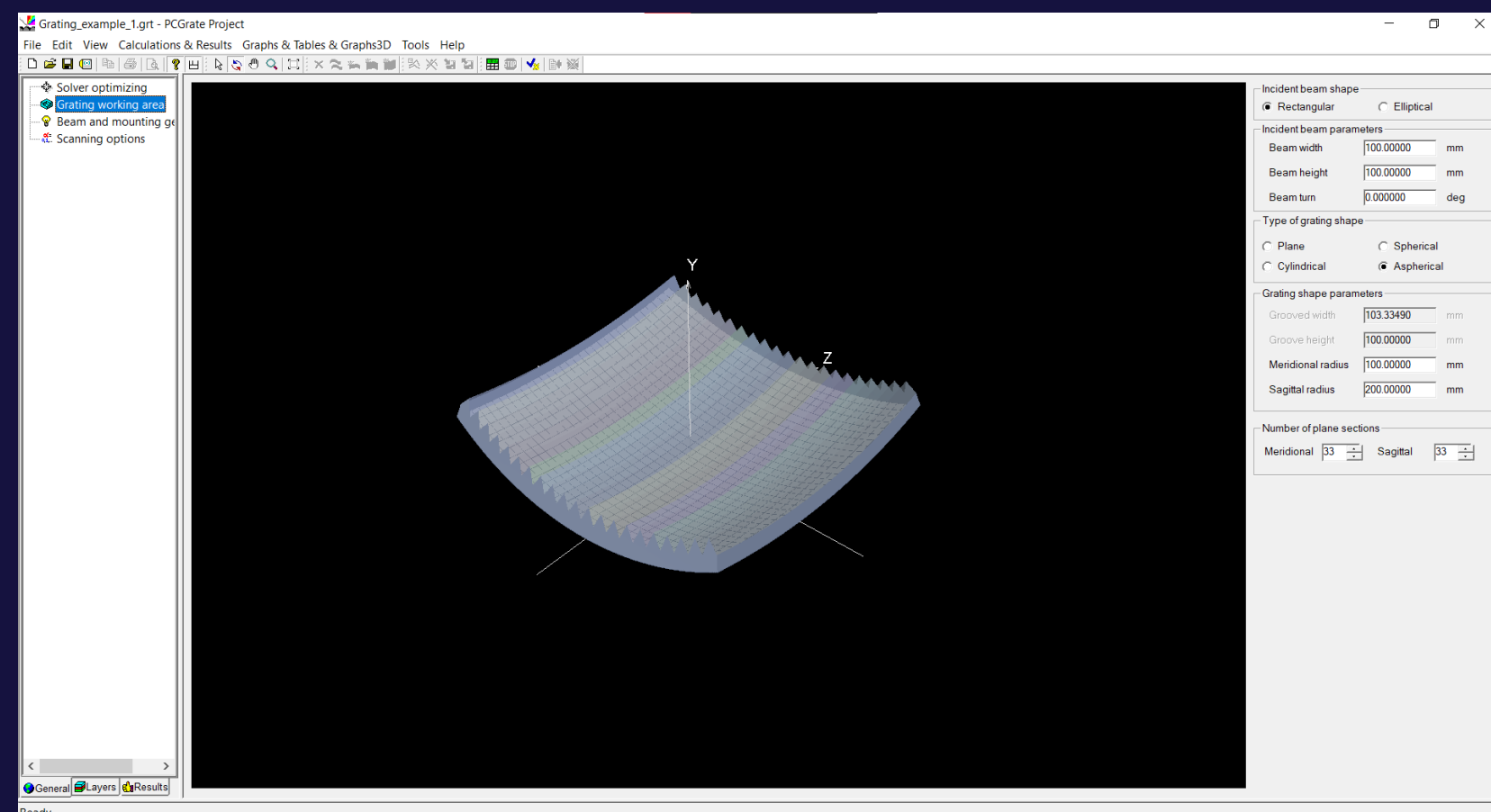
# PCGrate<sup>®</sup> Capabilities



PCGrate<sup>®</sup> software enable the user to accurately solve periodic boundary value problems\*, which describe the incidence of a light beam on the relief or phase diffraction grating, zone plate or rough mirror.

\*Goray, L. I. & Schmidt, G. (2014). In Gratings: Theory and Numerical Applications, E. Popov, ed., Ch.12: [https://www.fresnel.fr/files/gratings/Second-Edition/Chapter12.pdf]

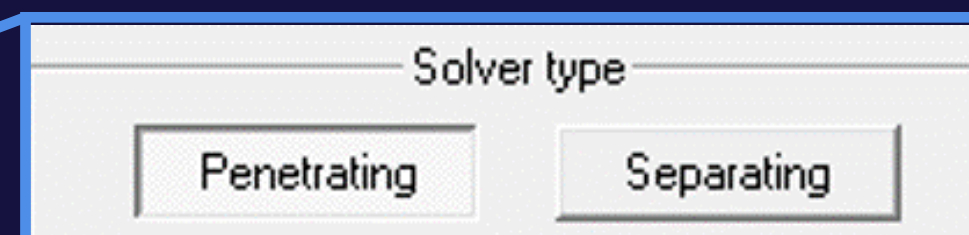
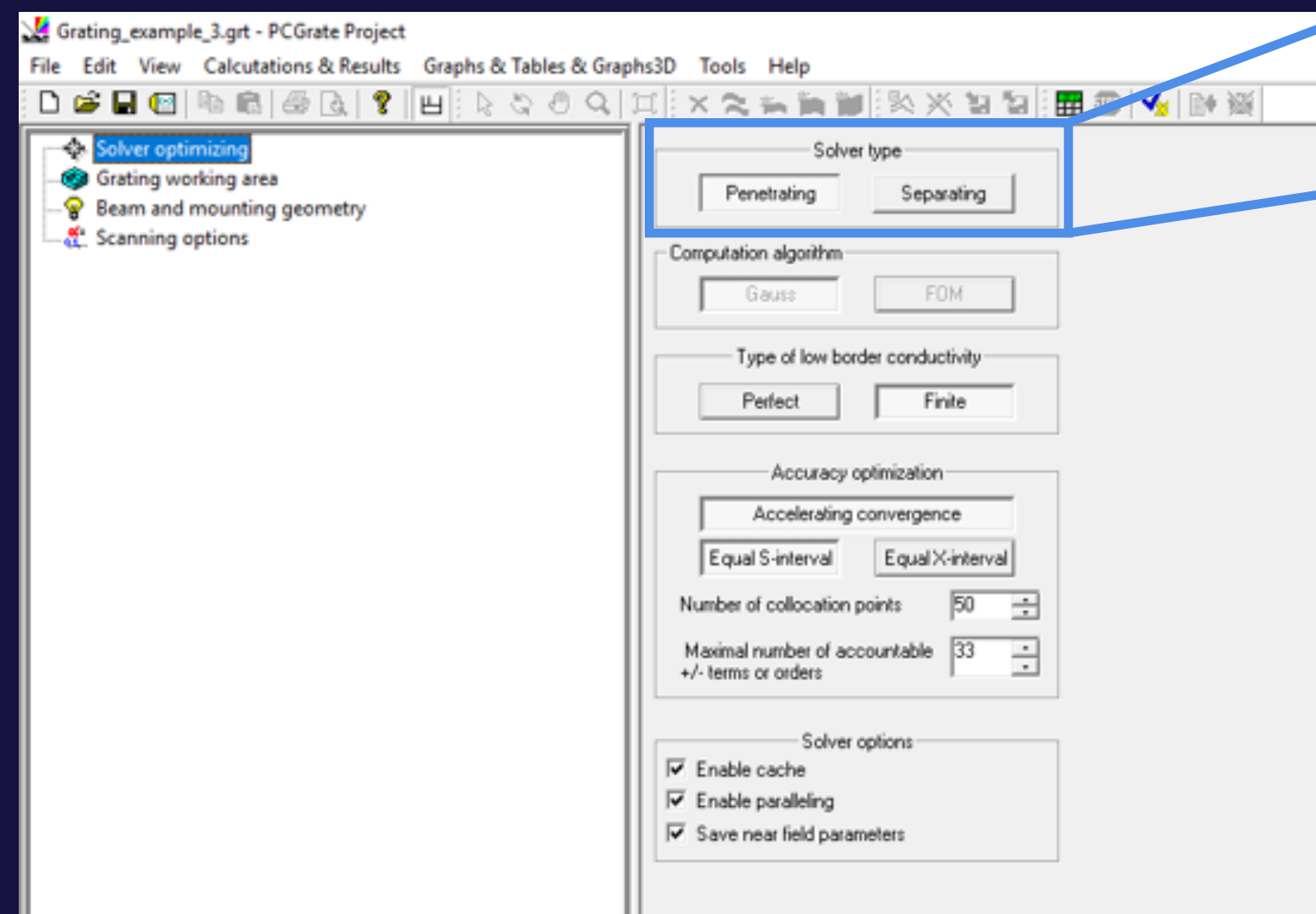
# PCGrate<sup>®</sup> Capabilities



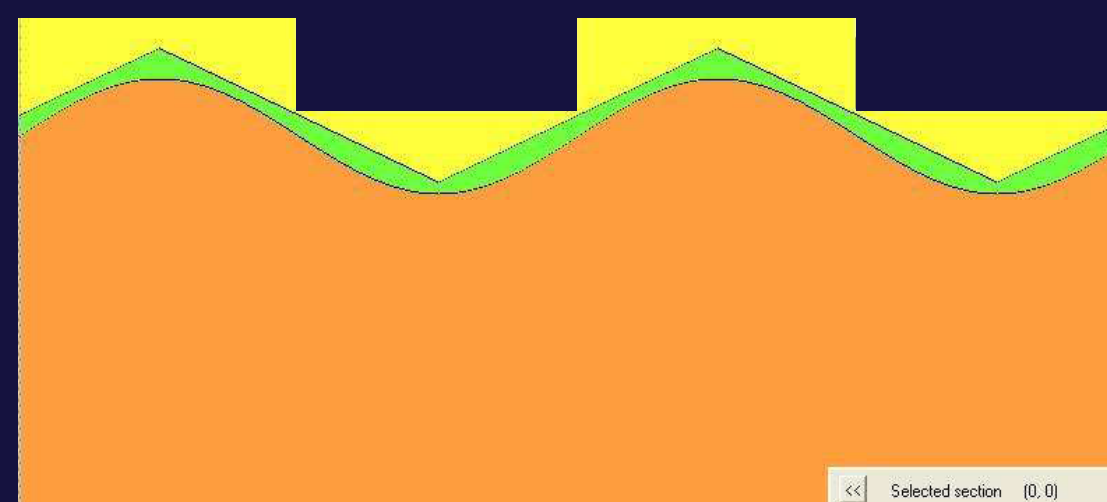
PCGrate software enable non-planar incident waves and concave/convex grating shapes.

PCGrate software enable many-shaped, with non-conformal and non-function border profiles.

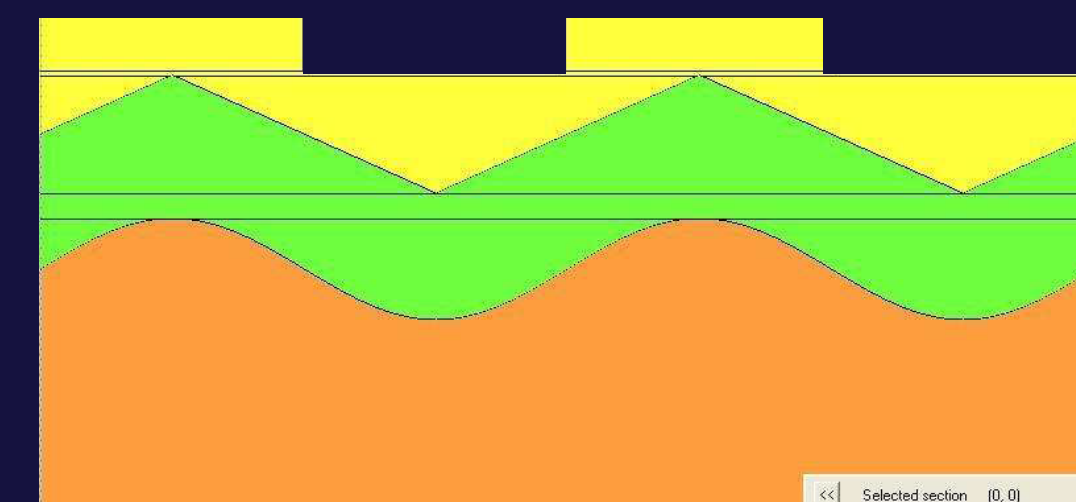
# PCGrate<sup>®</sup> Capabilities



A multi-boundary grating model which can be calculated with the Penetrating solver only.



A multi-boundary grating model with plain gaps between two adjacent corrugated regions.



There are two types of solvers available in PCGrate<sup>®</sup>, i.e. Penetrating and Separating. The solvers have different behavior and mutually complementary capabilities for many difficult cases such as coated gratings with thin layers, randomly rough periodical or non-periodical structures, grazing incidence, and photonic crystals.

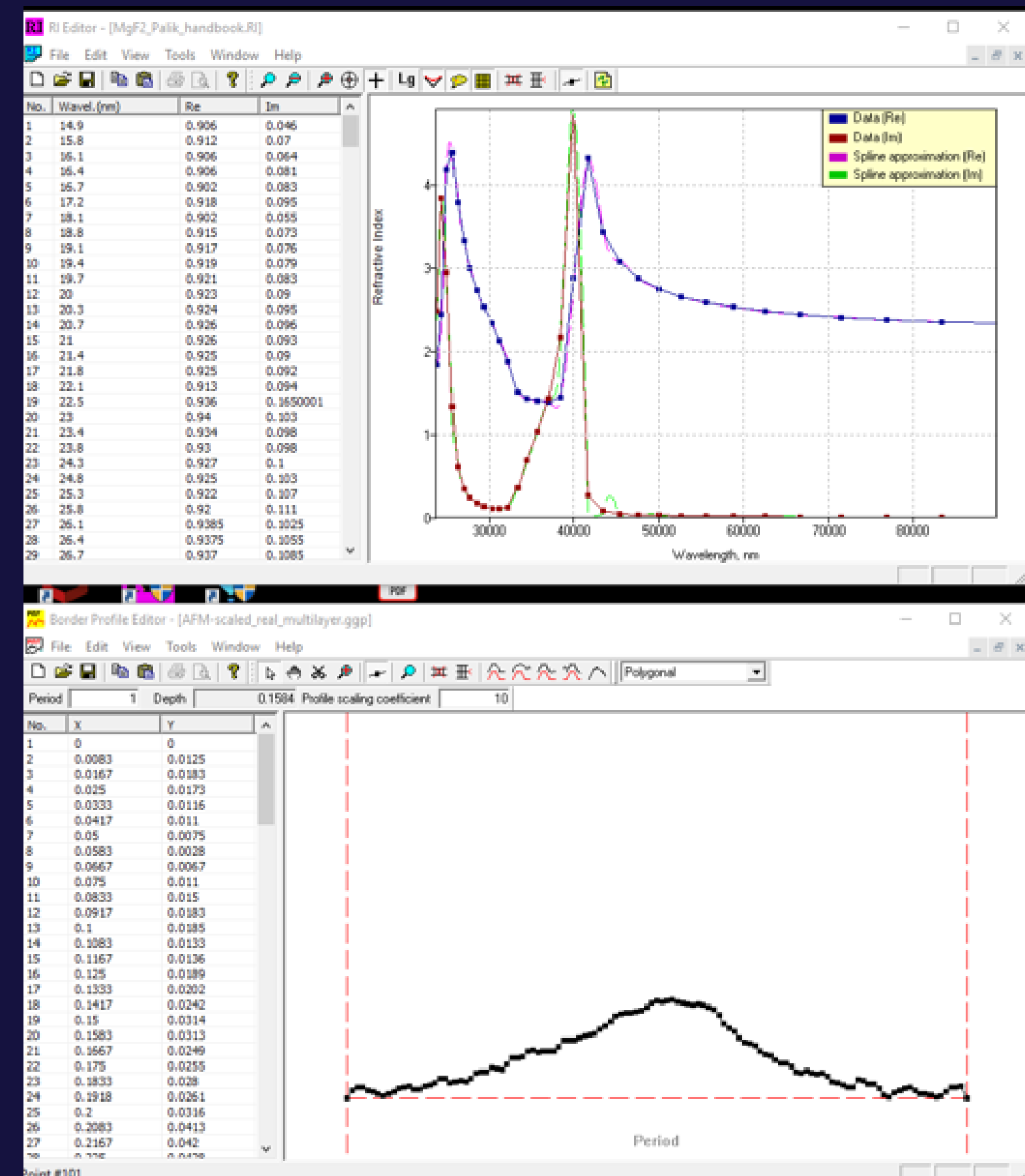


# PCGrate<sup>®</sup> Capabilities

PCGrate<sup>®</sup> software (including Demo) also includes two separate applications:

Refractive Index Editor is a tool for working with Refractive Indices Libraries. You can create new libraries, view their contents, edit them and import/export them. It has a multiple document interface, i.e. you can open as many documents for editing as you wish.

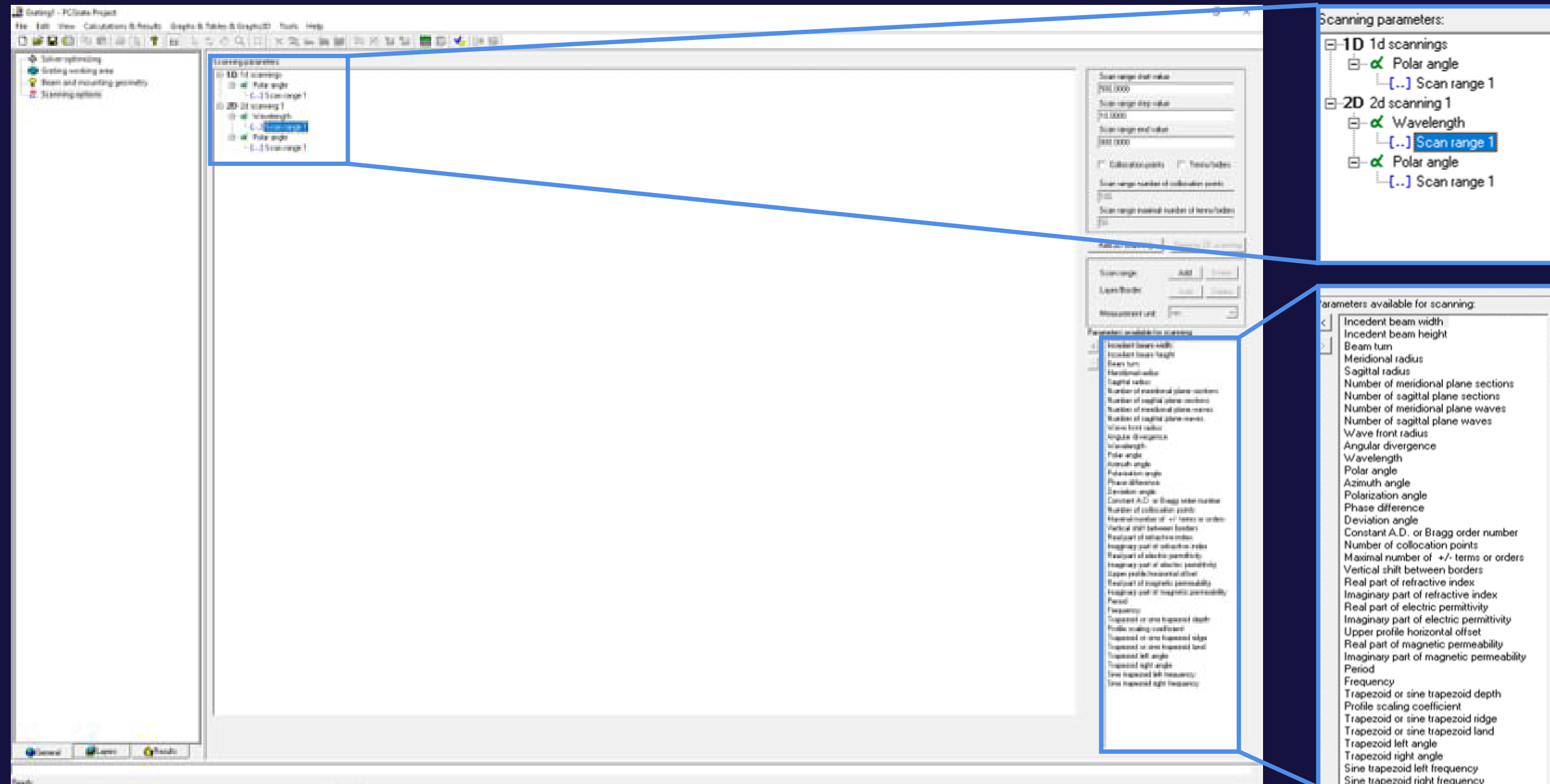
Border Profile Editor is a tool for editing files with border profile functions of grooves. The following types of diffraction grating profiles are supported: Lamellar, Triangular, Trapezoidal, Sinusoidal, Sine trapezoidal, Polygonal, Cubic spline and Trigonometric. Border Profile Editor allows you to modify these profiles to suit your needs, including such operations as randomization, conversion to polygonal and customization of the profile itself. It also allows you to export these profiles to all supported formats: .csv, PCGrate Grove Profile Files (.gpp) and Excel.







# PCGrate<sup>®</sup> Results

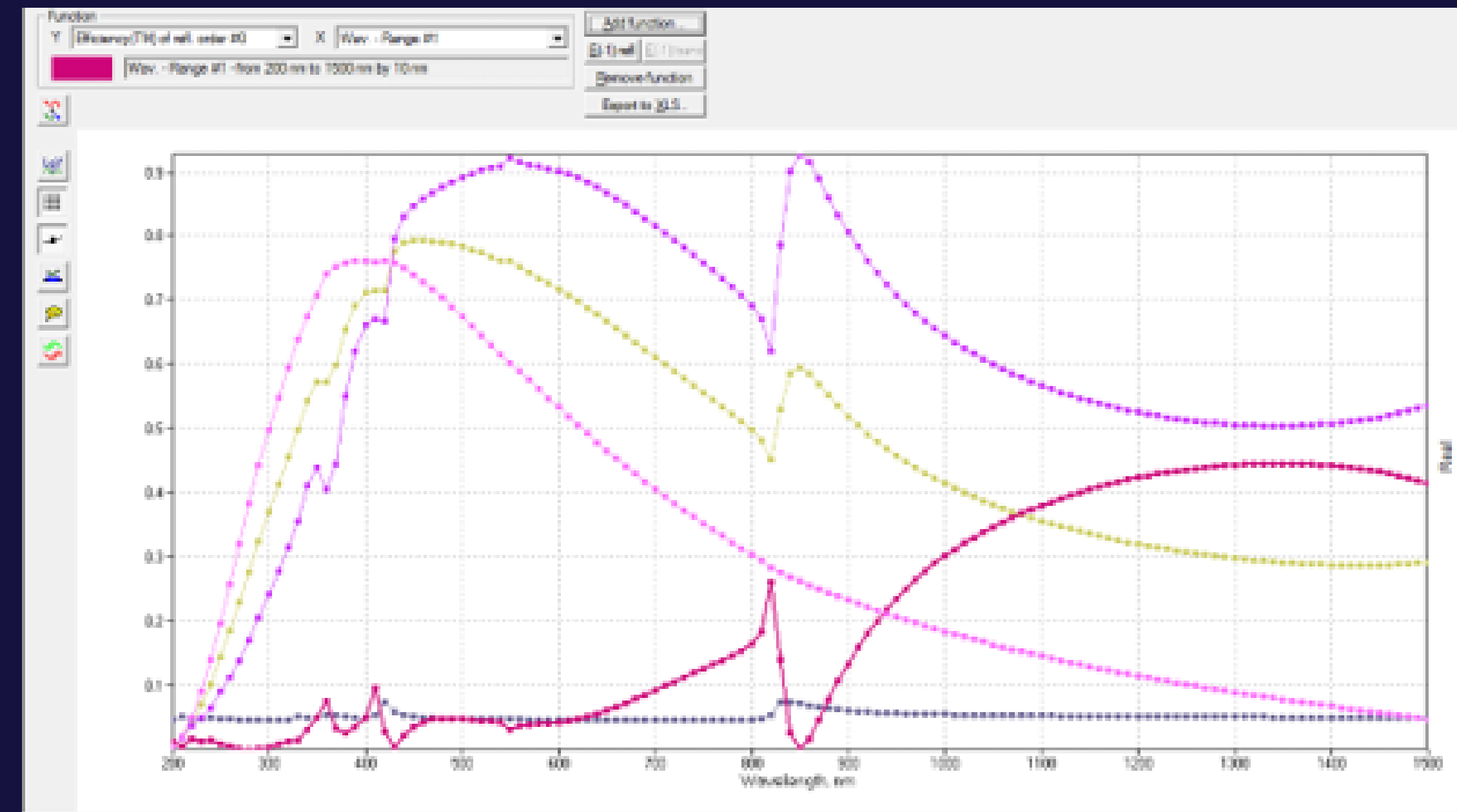
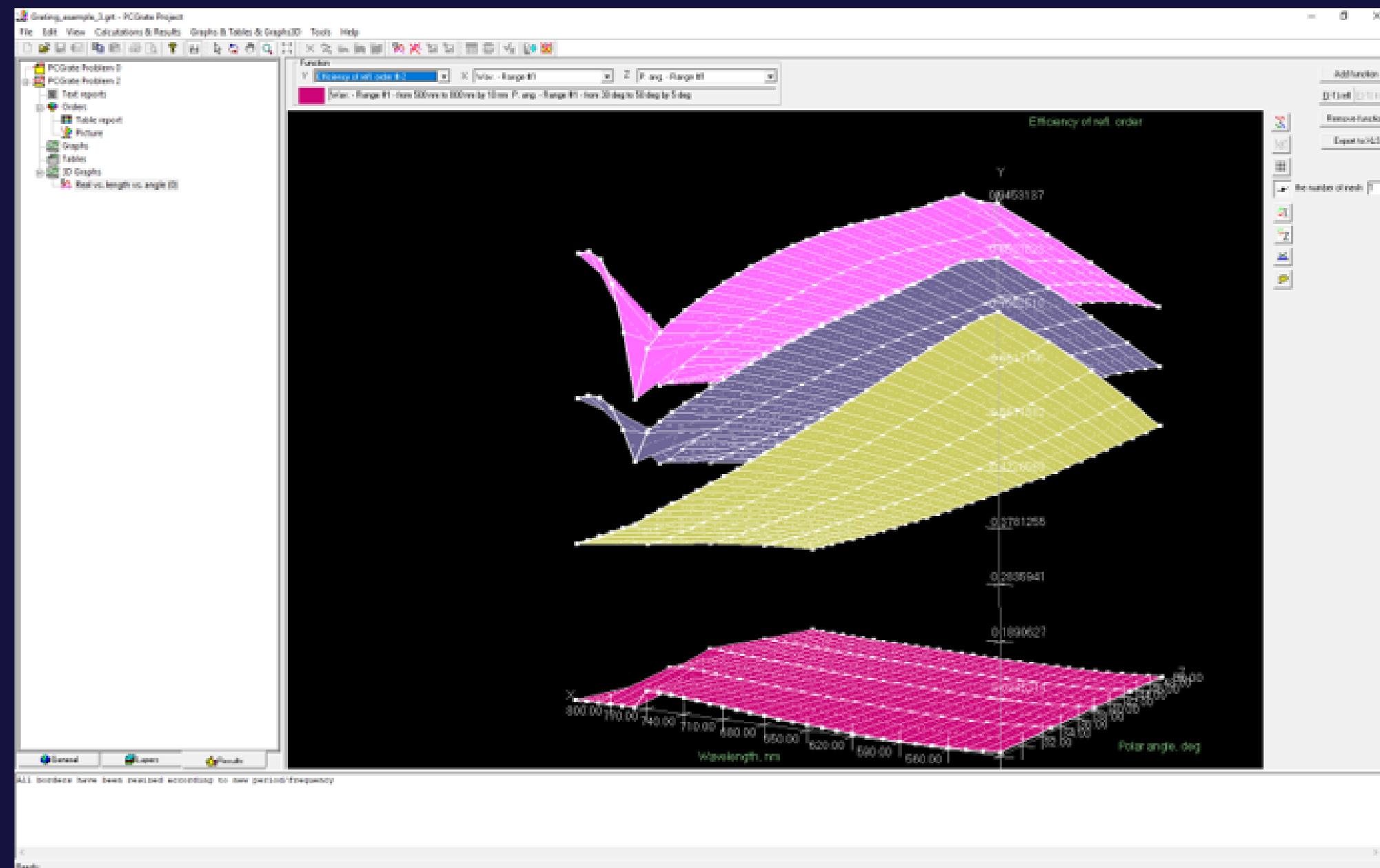


2D- & 1D-scannings include a wide range of scanning parameters.

PCGrate<sup>®</sup> includes 2D scanning & 3D efficiency plots. 2D scanning allows one to vary two independent parameters together to solve grating efficiency tasks.

# PCGrate<sup>®</sup> Results

3D & 2D efficiency plots allow one to visualize the results obtained with 2d & 1d scanings.



PCGrate<sup>®</sup> uses Graphical User Interface with 3D and 2D Open GL graphs.



# PCGrate<sup>®</sup> Advantages

Our codes are indispensable for efficiency calculations in the following problems:

- ✦ The x-ray–EUV range and very small wavelength-to-period ratios;
- ✦ Echelles and gratings at diffraction order numbers ranging from low to very high (thousands);
- ✦ Taking rigorously into account periodical and random roughnesses of any kinds;
- ✦ Pulse compression and high conductivity;
- ✦ 1-D & 2-D photonic crystals and multilayers with rough and non-conformal borders;
- ✦ Non-planar incident waves and concave/convex grating shapes;
- ✦ Any polarization states and other fine peculiarities.

The codes are especially convenient and accurate for modeling with the real border profile function. An example of this type is the case of groove profiles determined by: an atomic-force microscope (AFM), a transmission electron microscope (TEM), a micro-interferometer, a stylus profilometer, and also by indirect methods like actual growth modeling, etc.



# PCGrate<sup>®</sup> Advantages

The PCGrate<sup>®</sup>-S(X)<sup>™</sup> v. 6.7.1 32/64-bit series available for Windows OS machines from Windows Vista<sup>™</sup> to Windows 11.

Key parameter	PCGrate <sup>®</sup> -S <sup>™</sup> v.6.7.1	PCGrate <sup>®</sup> -SX <sup>™</sup> v.6.7.1
Wavelength	From x-rays to meters	
Minimal wavelength-to-period ratio	0.02	2e-13
Diffraction order range	±100	±10000
Maximal number of layers	20	10000
Non-periodical structures, non- function border profiles & photonic crystals		Yes
Rigorously accounting random roughness		Yes
Gaussian beams, concave/convex, VLS & VGD gratings		Yes

# Licence types

Key parameter	Permanent	Perpetual
Free upgrades	Not included	Included
Tech support	1 year	2 years
Key types		SL-only

# UI-types

<b>Interface type availability</b>	<b>XML</b>	<b>GUI</b>	<b>COMPLETE</b>
Graphical User Interface	No	Yes	Yes
Command Line Interface	Yes	No	Yes

# PCGrate<sup>®</sup> Distributors

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