Program Package

Software Package called “FPC Simulator” has been developed. “FPC Simulator” is a full analysis solution, providing the user with facilities to construct the space lattice complicated configurations, consisting of the knot items of arbitrary complexity and nesting level, to specify its material parameters, as well as to calculate, post-process and visualize the photonic crystals’ desired characteristics. The editing tools allows user to specify and modify cell items in terms of editing both canonical and arbitrary user-drawn or imported geometry and optionally snapping it to the space rectangular or hexagonal lattice. The excitation and measuring sensors’ models’ placement and properties specification can also be performed both graphically, using the drag’n’drop technology, and/or specified explicitly.

The software contains the module for the unattended determining of the critical frequencies.

The results of the simulation can be presented in text or graphical form – the program uses it’s own, specially designed for the EM field visualization modules – or exported – in both text and graphical form – to the convenient word-processing programs.

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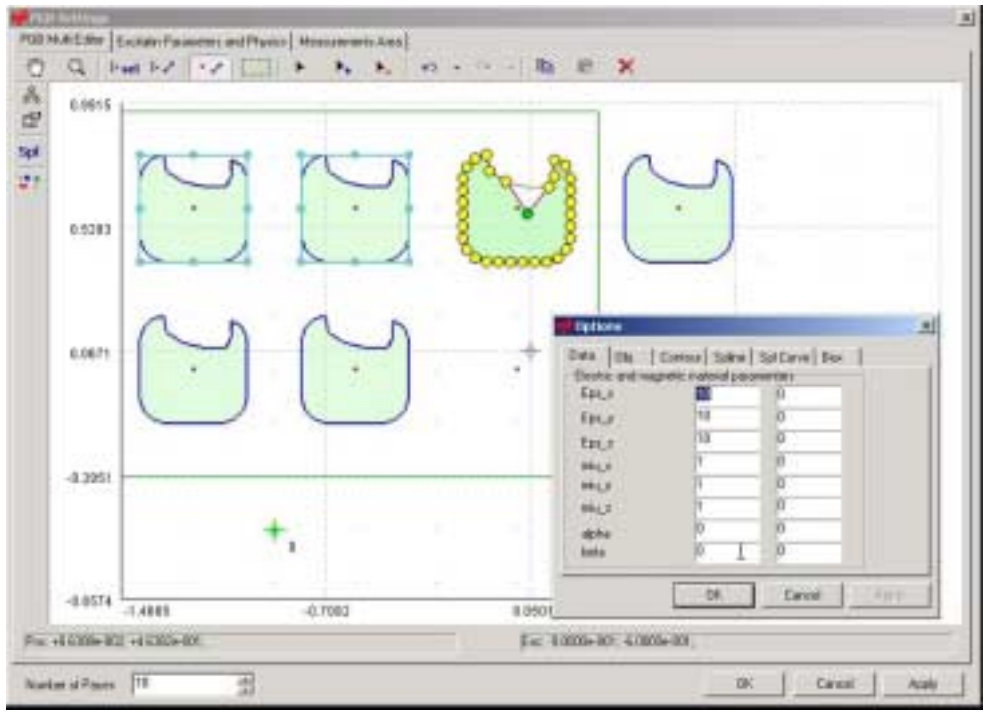
Geometry generation. On the elementary cell's geometry creation stage user can start with the analytically defined contour from the set of available or imported ones, and then explicitly transform it to be of the most appropriate shape using internal contour path editor. Each created object can be copied, stored and duplicated, thus making creation of the gently different cells more convenient. One must mention the facilities to compose the compound object of arbitrary nesting level by means of picking the desired object and ragging into the other – thus creating the super-object that can also be used as an elementary grating's cell. The material parameters include all the data necessary to describe the biisotropic media and can be simultaneously changed for a set of objects. Each modification to the scene can be undone and redone, simplifying the experimenting with the different parameters.

There are three available lattice types – the triangular, rectangular, and hexagonal ones. The grating itself is virtual – that means that there is no necessity for the objects to always conform it – but the objects may snap to the grid nodes when being dragged, thus simplifying the precise positioning and defects in the crystal creation. In addition, a possibility to introduce the pseudo-random displacements of the objects' positions to consider the imperfection of the real world structures is available. This is a power facility that is very important when simulating or developing a real-world device prototype – because of the operating bands of such devices are narrow enough high precision is often required not to impact the desired operation, thus is very important to know, how precise the implementation should be for the device to operate normally.



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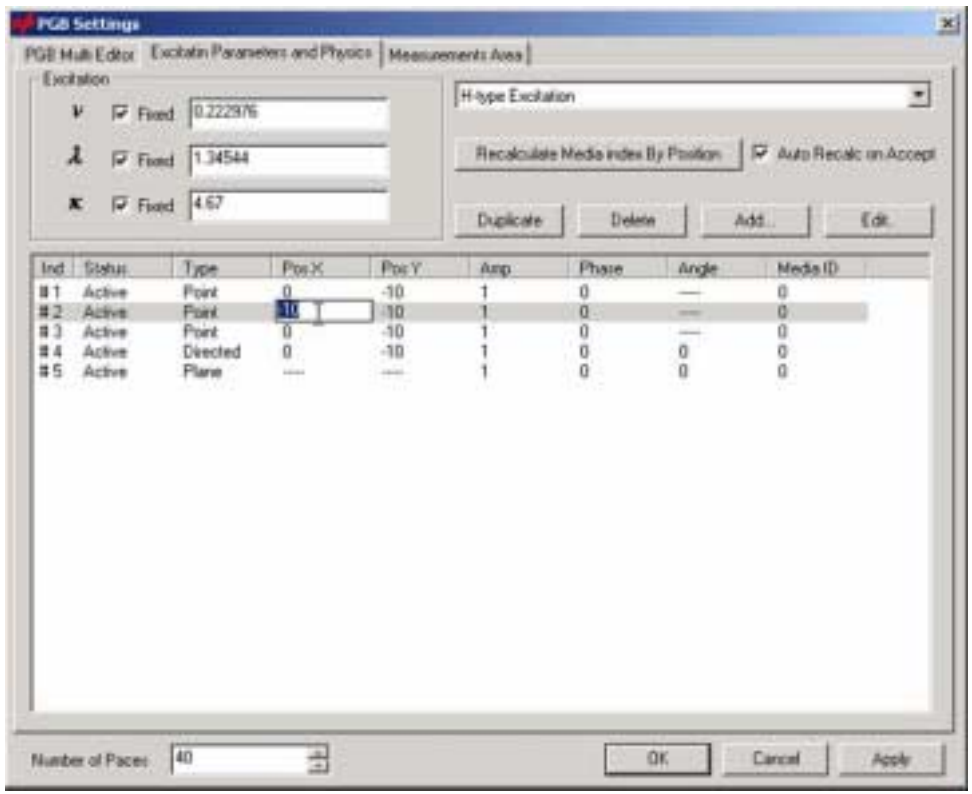
Excitation setup. An arbitrary number of exciters of the three available types – “Plane Wave”, “Linear Source” and “Directed Beam Source” – can be introduced into the scene. Their properties (such as placement, orientation, amplitude and phase) can be specified both manually and graphically – by direct picking and dragging it into the desired domain using mouse.

Numerical Measurements. Several types of measuring facilities are provided, corresponding to the real sensor types. This includes the far field and energy distribution as well as near field structure calculation, and also measuring the local field properties by placing the specially design sensors’ models in the domains of interest, that simulate the real-world measuring devices having their own relaxation times and sizes.



Calculations. There are two modes of calculations available:

1. Single Mode. The data is set up and the calculations give the required results for the given configuration.
2. Parametric Mode. The bounds of one or more parameters are specified and the dependences of the objects’ various properties on them are obtained. This mode is used for the spectrum obtaining, or other dependencies evaluation.

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Results visualization. The results of calculation are represented in the convenient way using specially designed visualizing components – including 2D plots and 3D field representation with real-time animation support and field isolines drawing. These facilities can exchange data with the office software, simplifying the creation of reports and presentations. The program package is extendable to introduce various physical output data generation due to the implemented plug-in support. The data can also be exported in the numerical format to the text file for the latter reference.