

Photonic Bandgap (PBG) Waveguide Modes

Introduction

Tools used: BandSOLVE, MOST

The purpose of this tutorial is to give a general guide to calculating projected band structures of photonic bandgap (PBG) structures and defect modes. In particular, we show how to scan over the k-vector in the plane of the photonic crystal using **BandSOLVE** and **MOST**. The examples in this tutorial are based on the analysis in Ref [1] by Mekis et al.

Creating the Structure

This example consists of a 2D cubic array of dielectric GaAs circles with refractive index of 3.4 in the XZ plane in a background material of air. The radii of the circles will be 18% of the period. A line defect is created in this lattice to form the waveguide along which modes can propagate.

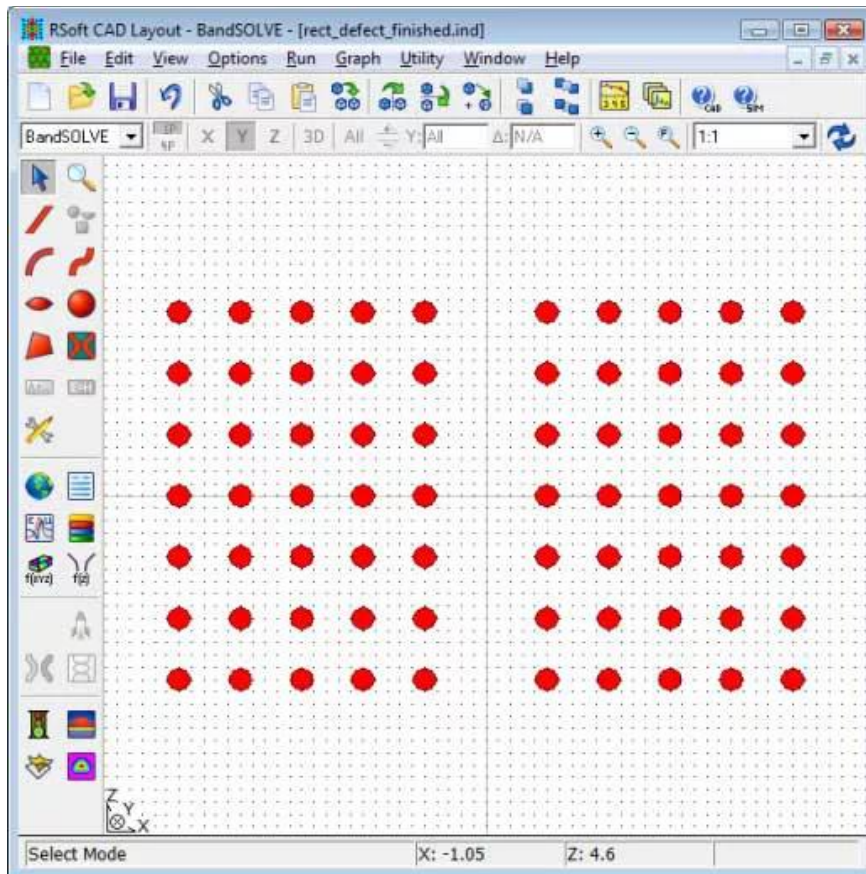


Figure 1. A 2D cubic array of dielectric GaAs circles

Simulation Results

The simulation results for this structure are:

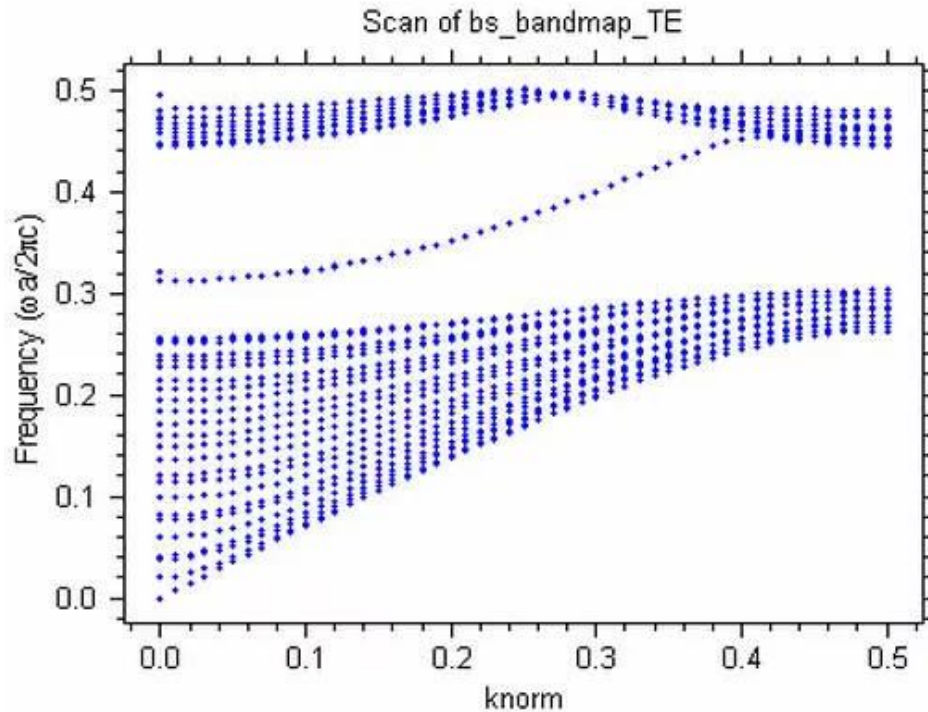


Figure 2. Simulation results

This result shows the projected band structure for the defect mode in this waveguide, and is the result of a scanning over the k-vector along the propagation direction.

References:

- [1] Attila Mekis, Shanhui Fan, and J. D. Joannopoulos, Bound states in photonic crystal waveguides and waveguide bends, Phys. Rev. B 58, 4809 (1998).