

## **Coupling of photonic crystal–photonic crystal interface and guided modes in two-dimensional heterostructures**

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### **Abstract**

In this work, we propose a two-dimensional photonic crystal–photonic crystal heterostructure that possesses the requirements for exciting an electromagnetic interface mode and investigate its interaction with photonic crystal waveguide modes. To study the interaction and coupling of both types of modes, the proper conditions to excite them are analyzed. Photonic crystal guided modes can appear in nearly any band gap when the photonic crystal has a line of defects within its lattice. Photonic crystal–photonic crystal surface modes can be excited at the junction of two different photonic crystals that share translation symmetry along the interface direction and have overlapped frequency band gaps. When this condition is met, dispersion relations of photonic crystal–photonic crystal surface modes will lie in the common region of both band gaps. Once the proper conditions are provided to excite these two modes, an interaction between them is possible. In the resulting calculations, a symmetric supercell and a plane wave basis are defined to numerically solve the wave equation.