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## 5. Conclusion

In this paper, we reported on a numerical study of the flat band Bloch modes in a photonic crystal with Dirac cones. We proved numerically that the non-zero  $k_y$  gives rise to non-zero index medium behavior. Furthermore, to understand how modes propagate and interact in the PhCs, we derived the weak expressions and performed the complex-k band and transmission calculations. Though the explanation of the spectral features turns out to be multiple reflections of the eigenmodes, the simulation method offers us a way to separate the coupled Bloch modes in a PhC slab and manipulate each with great freedom. We use this method to explain the physical origins of the different line-shape features in the transmission spectrum. In addition, our method allows to study the surface scattering of a truncated PhC by eliminating the back reflection. We believe that our method of analysis will prove beneficial to understand the scattering properties of more complicated photonic crystal structure of final extent.

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