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High-efficiency nonlocal reflection-type vortex beam generation based on bound states in the continuum

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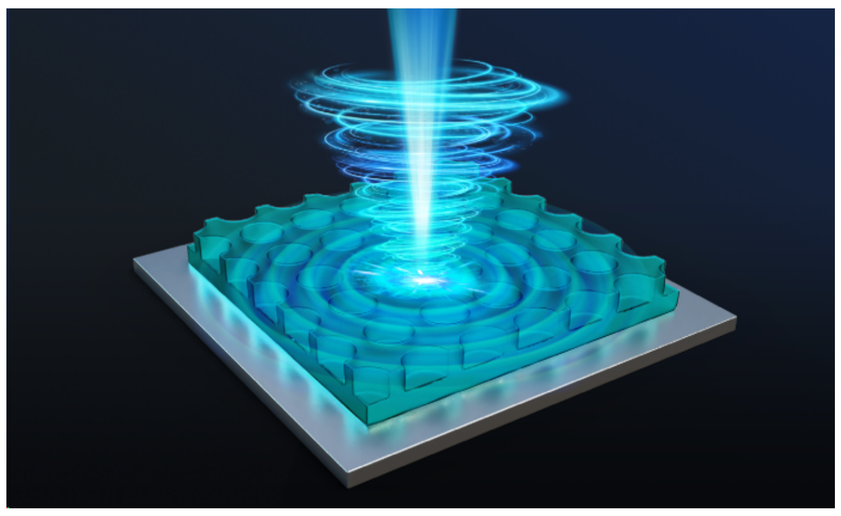
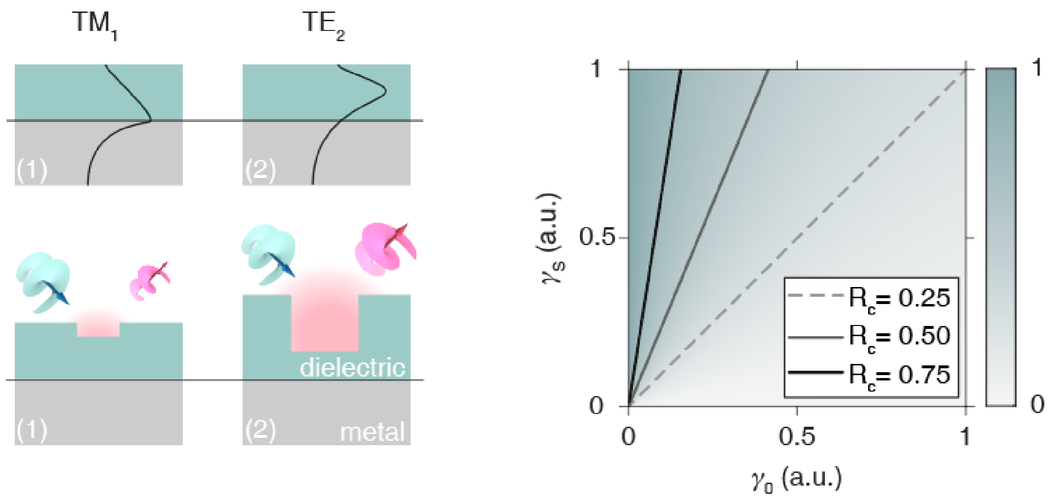
Introduction



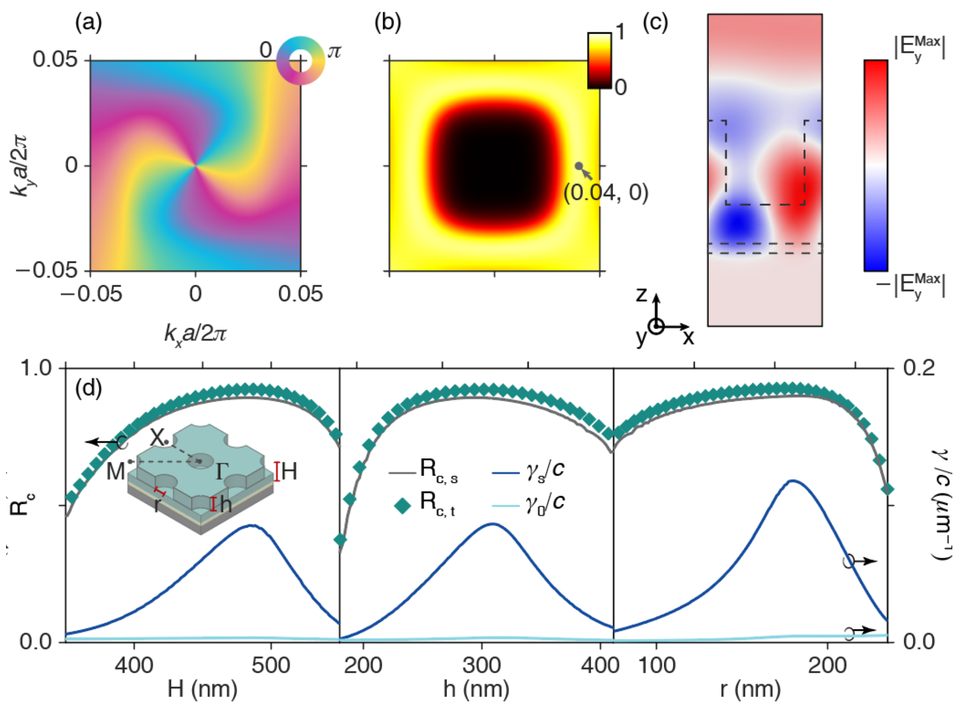
Schematic view of reflection-type PhC VB generator

Theoretical analysis

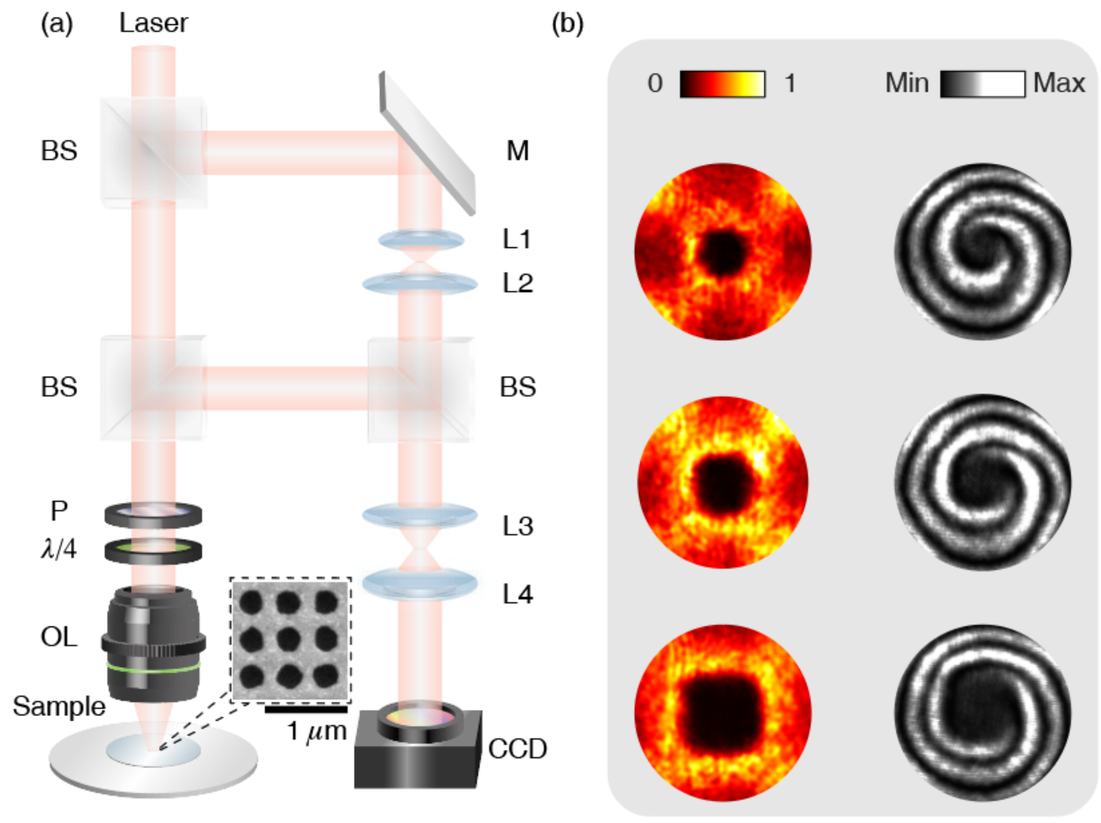


Top panel, the schematic electric field distribution of TM1 band and TE2 band in air-dielectric-metal structure was plotted. Field of TM1 gathers on the surface of metal mirror causing large intrinsic absorption. Bottom panel, large scattering rate caused by geometric structure in a unit cell corresponds to large radiation loss.

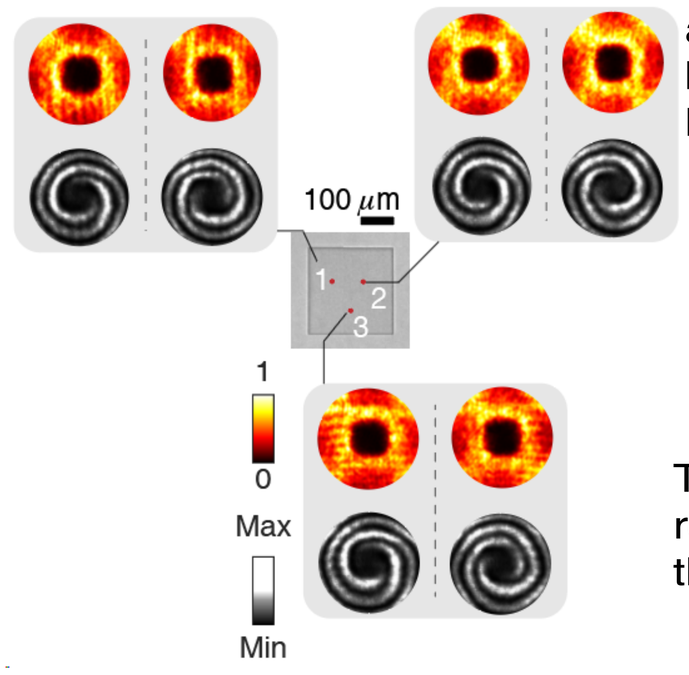
Sample Design



Results



Experimental setup and generated vortex beam in three wavelengths.



Three measurement regions (red dots) on the optical image.

Conclusion

In conclusion, we reported a TCMT-based approach to design high-efficiency nonlocal reflection-type PhC slabs for generating VBs. In this approach, selecting particular working mode of PhC slab can efficiently reduce the inevitable absorption loss of metal mirror in visible and near-infrared wavelengths, and further structure design will boost the generation efficiency. With such an approach, VB can be efficiently generated using PhC slabs with no alignment center and simple fabrication process, making VB one step closer to practical applications.