

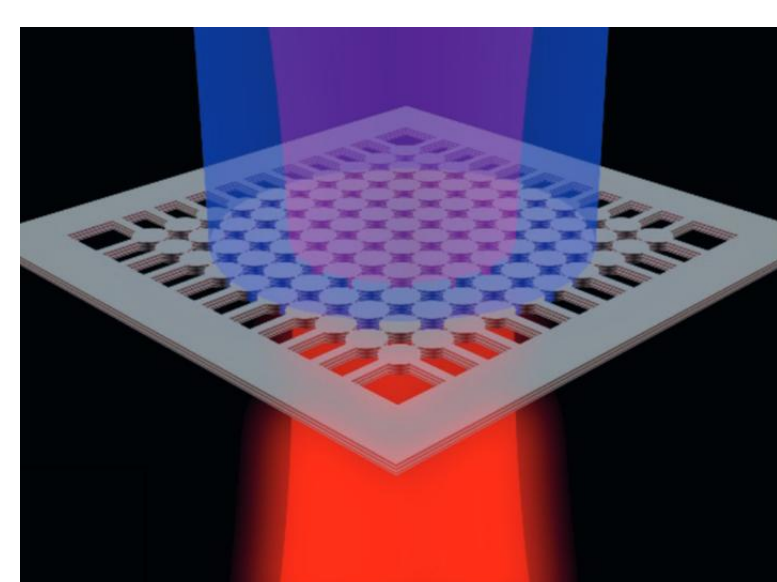
Vectorial lasing with designable topological charges based on Möbius-like correspondence in quasi-BICs

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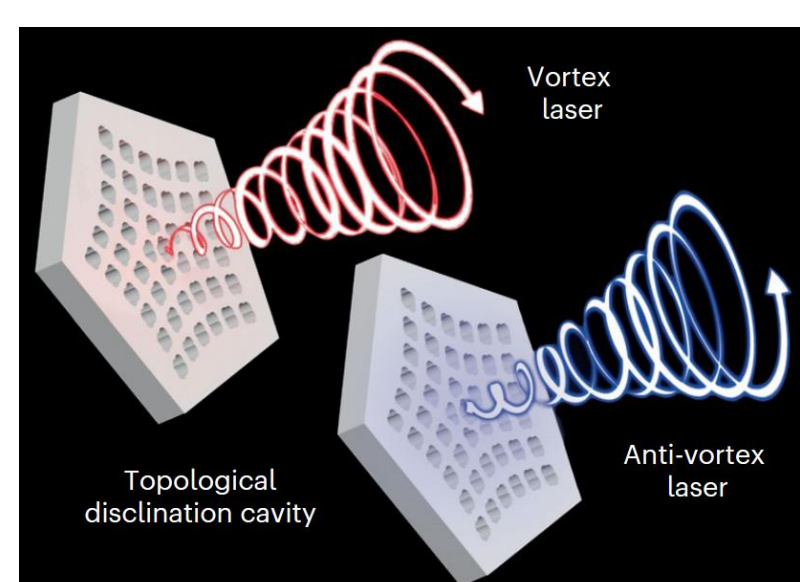
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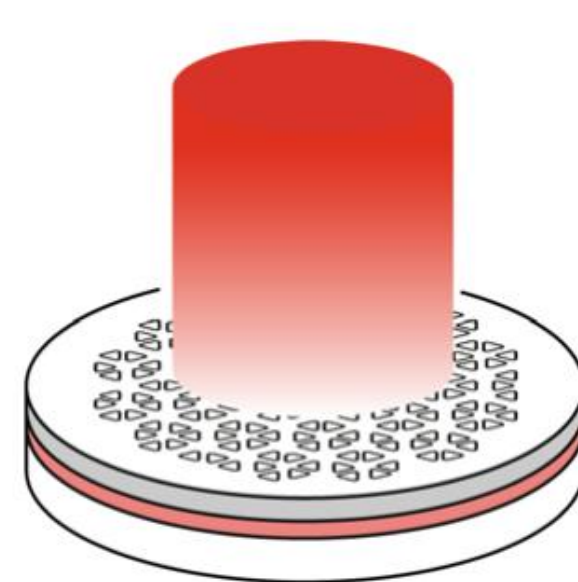
Vectorial topological charge confinement



Conventional BIC [2]



Disclination cavity [3]



Dirac vortex cavity [4]

Restricted by symmetry

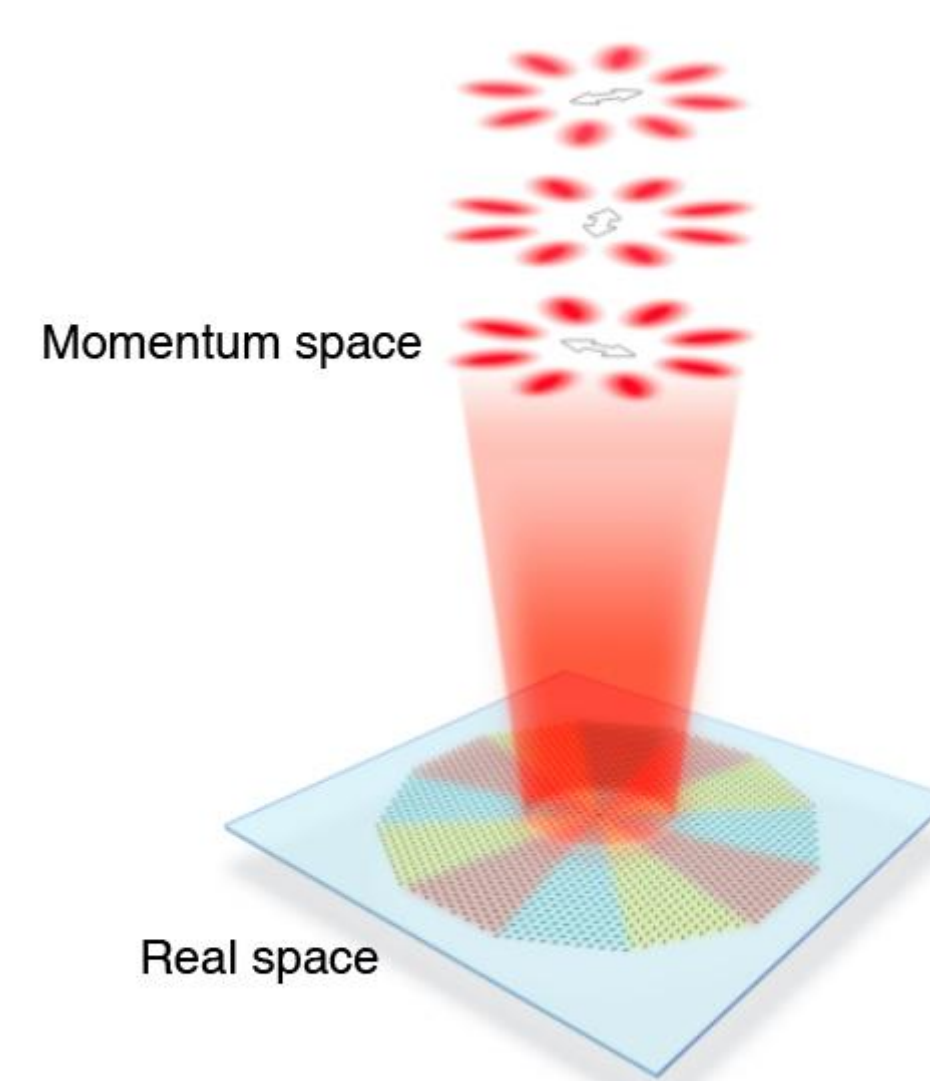
Lack of designability

$$C_4: q = 4n \pm 1$$

$$|q| = 1 - |l|$$

$$q \neq \omega$$

Our compound cavity



Compound cavity based on q-BIC PhC

Broad charge range

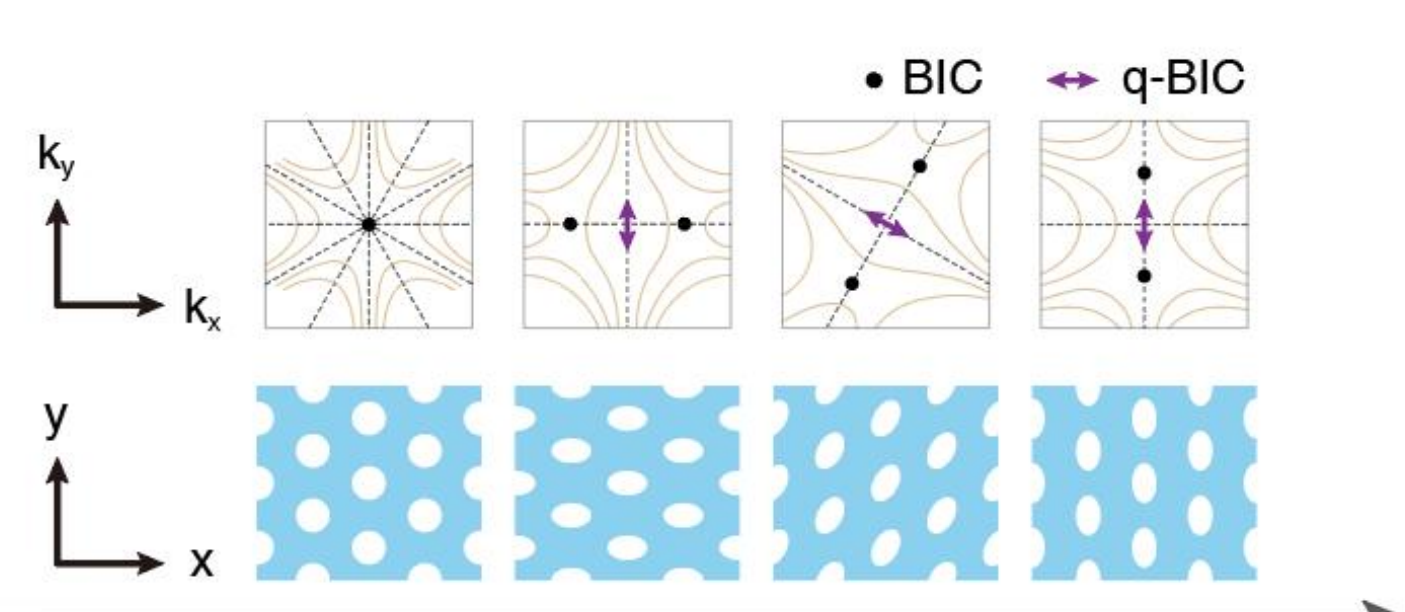
$$q = -5, \dots, 5$$

Designable lasing topological charge

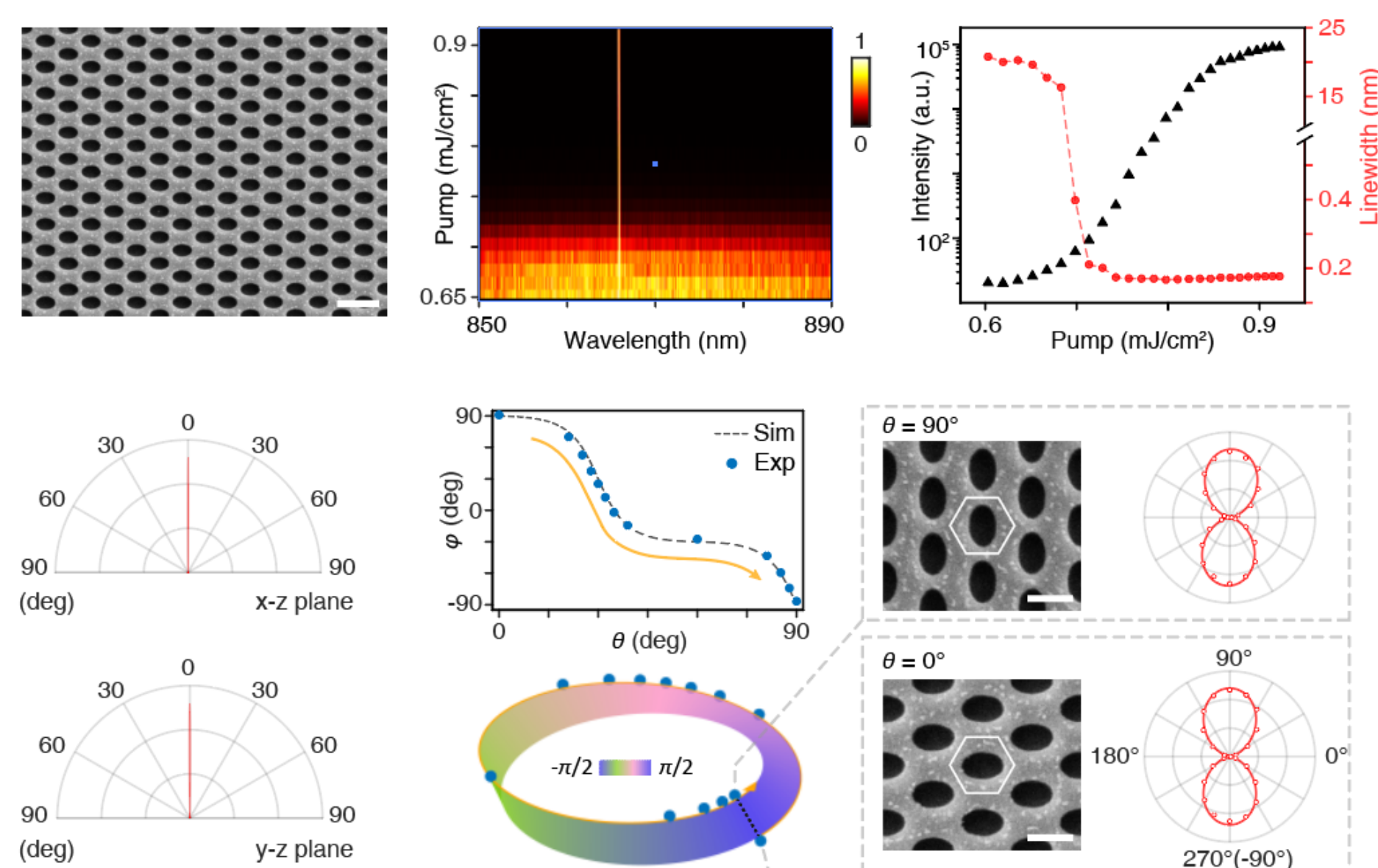
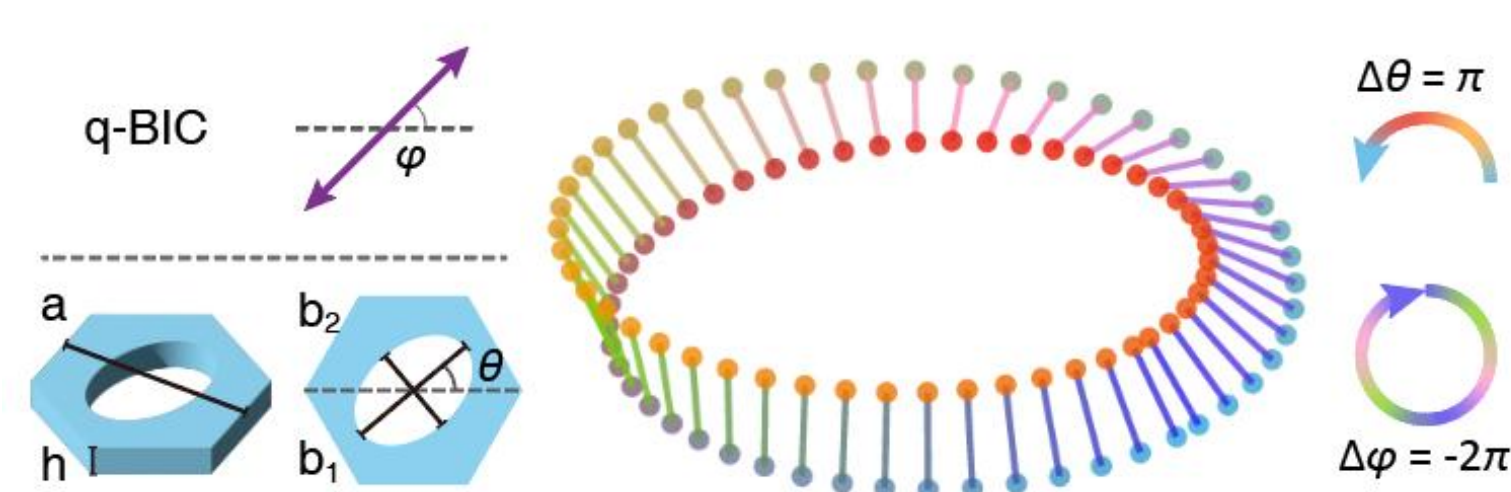
$$q = n$$

Möbius-like correspondence in q-BICs and experimental demonstration

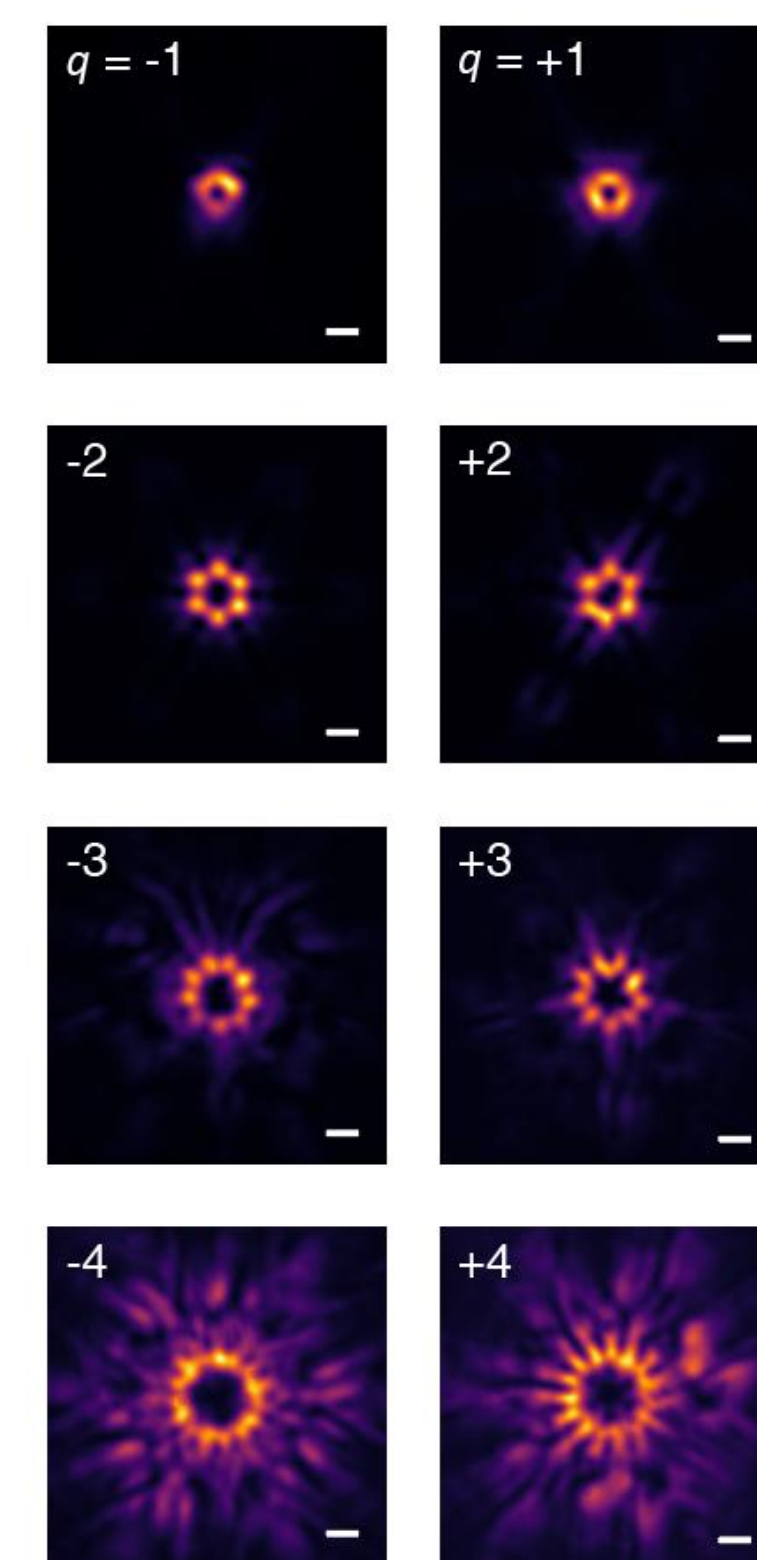
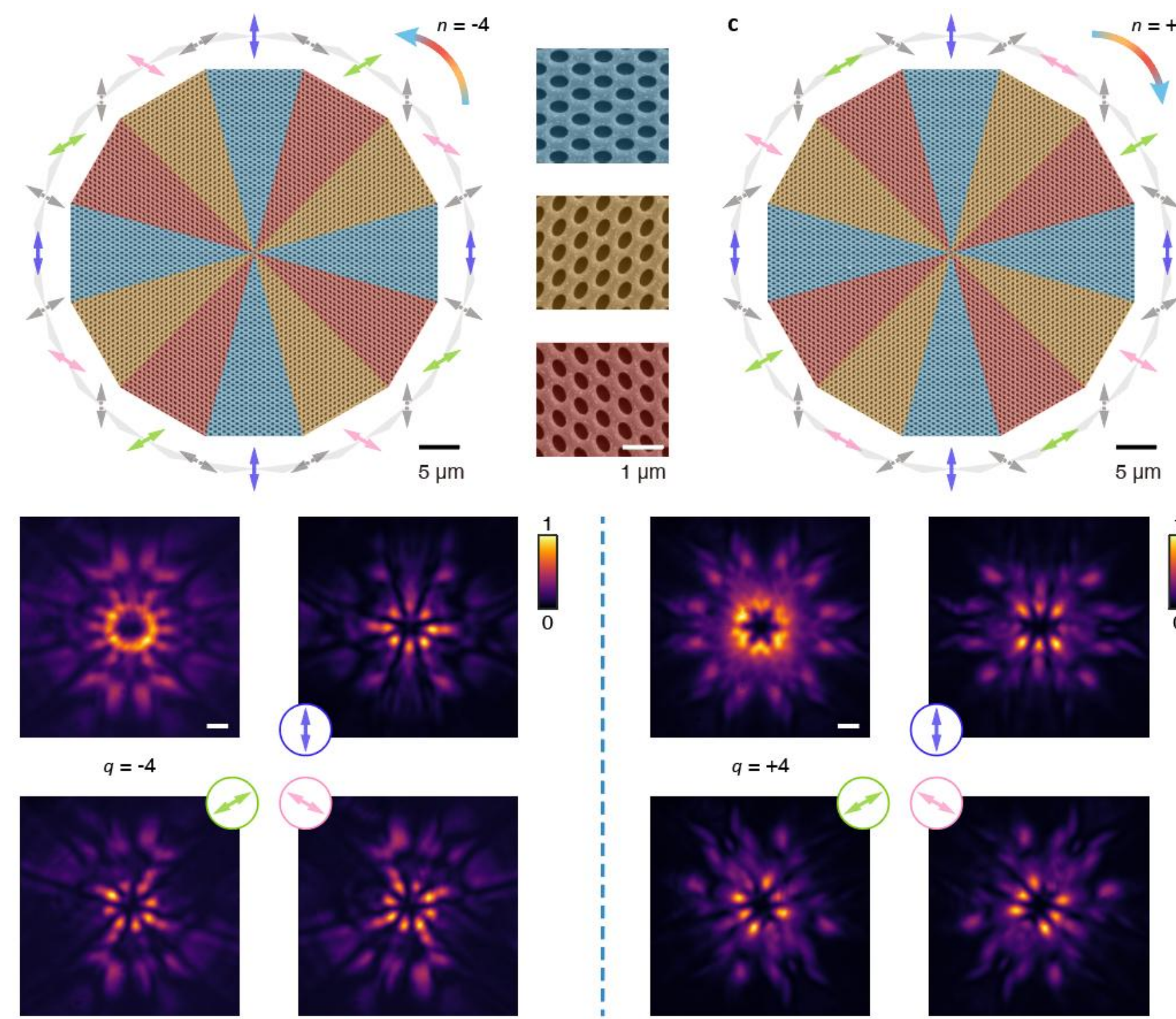
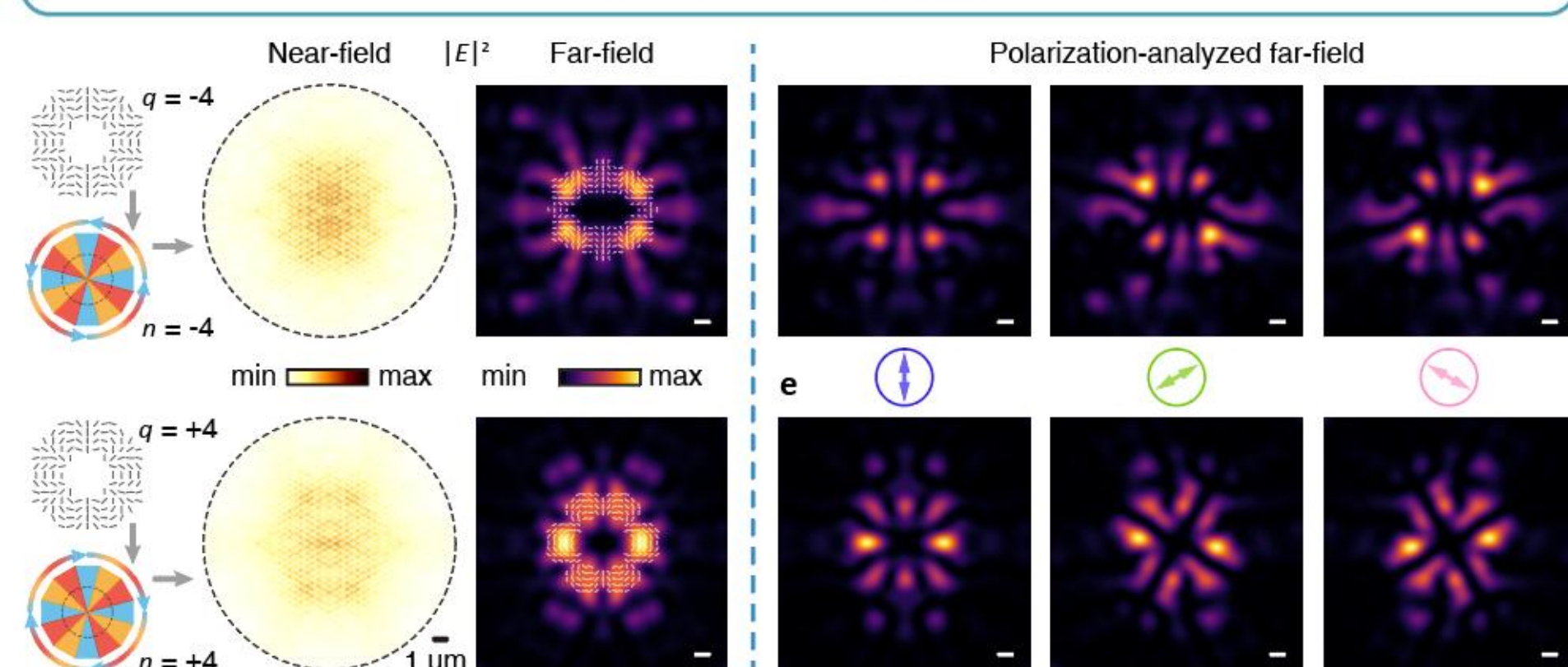
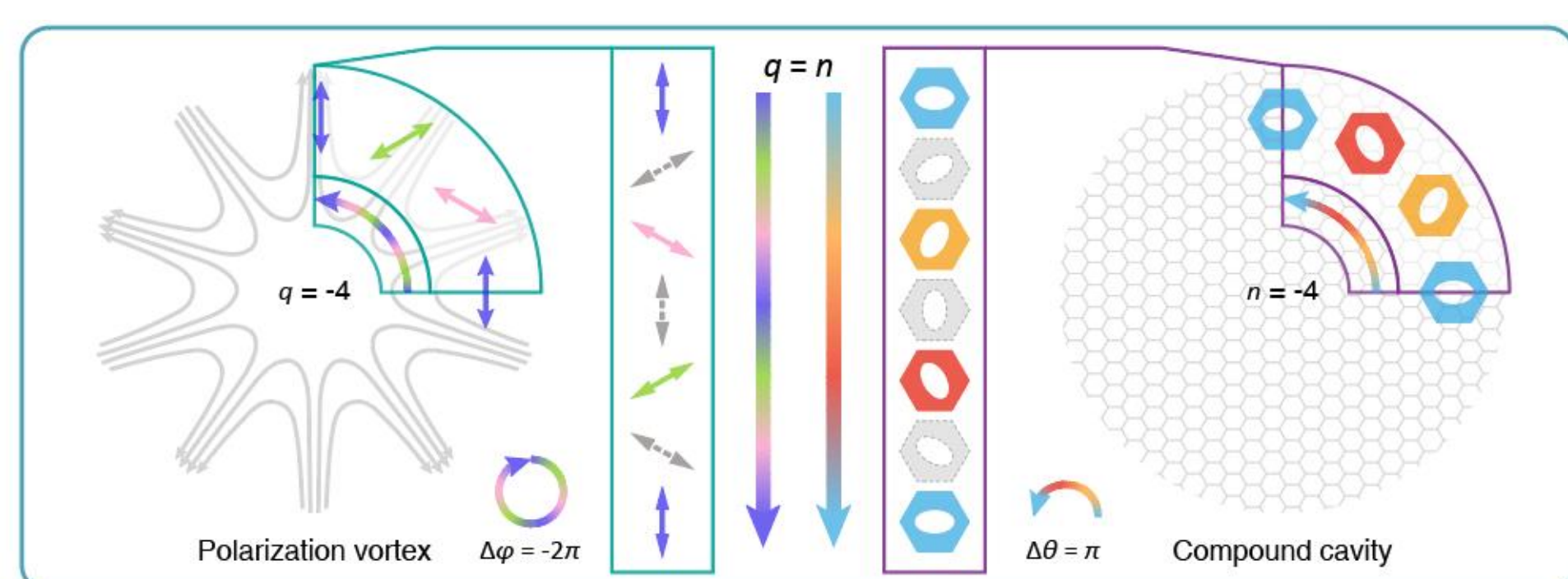
Symmetry broken q-BICs: $C_6 \rightarrow C_2$



Möbius-like correspondence



Compound cavity design principle and vectorial lasing



Conclusion

1. Revealing the Möbius-like correspondence in quasi-BICs under symmetry breaking.
2. Demonstrating vectorial microlasers with designable topological charges, establishing a one-to-one correspondence between cavity configuration and far-field profiles.
3. Expanding the achievable topological charge of vectorial microlasers into -5 and +5.

Reference

1. *Light: Science & Applications* **15**, 184 (2026)
2. *Nature* **541**, 196-199 (2017)
3. *Nature Photonics* **18**, 286-293 (2024)
4. *Nature Photonics* **16**, 279-283 (2022)