Ghost Sensing

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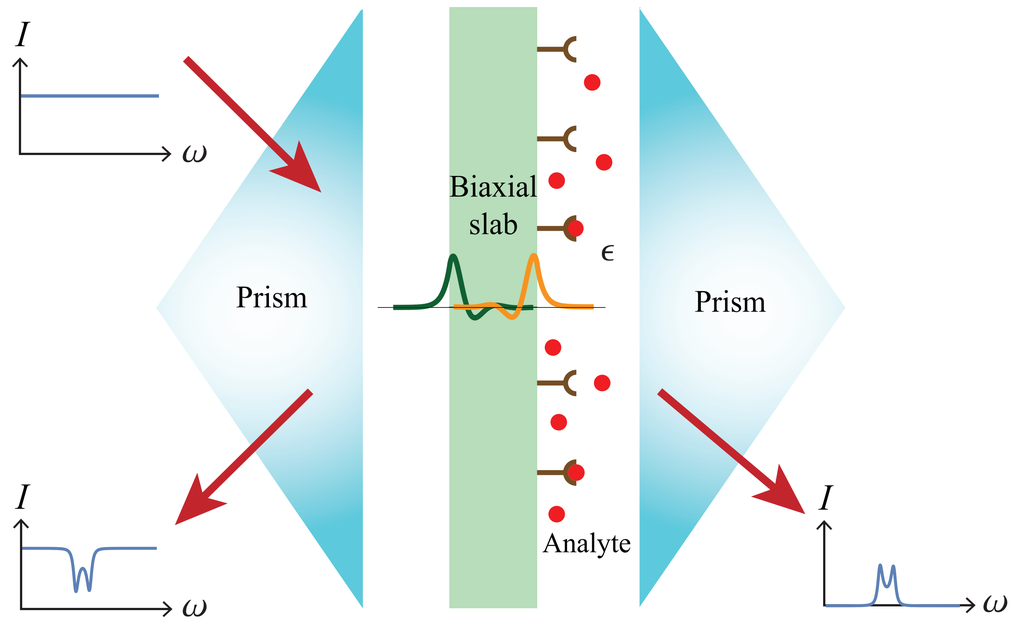
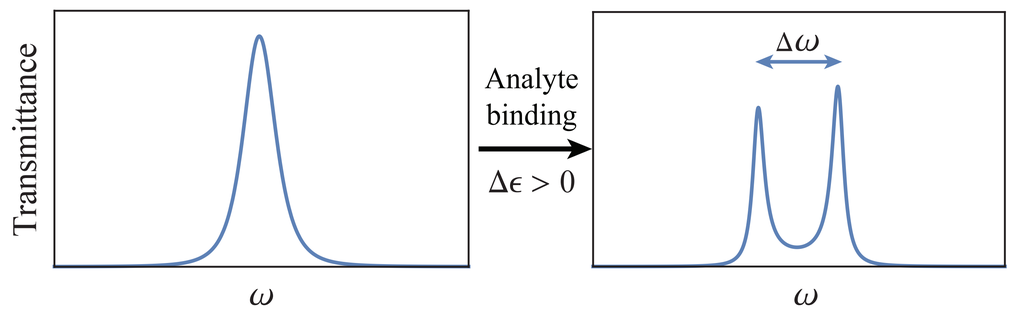
Interaction between ghost surface waves leads to exceptional points offering a new approach to optical sensing with enhanced sensitivity.

Sensor operation

Employs simple planar geometry:

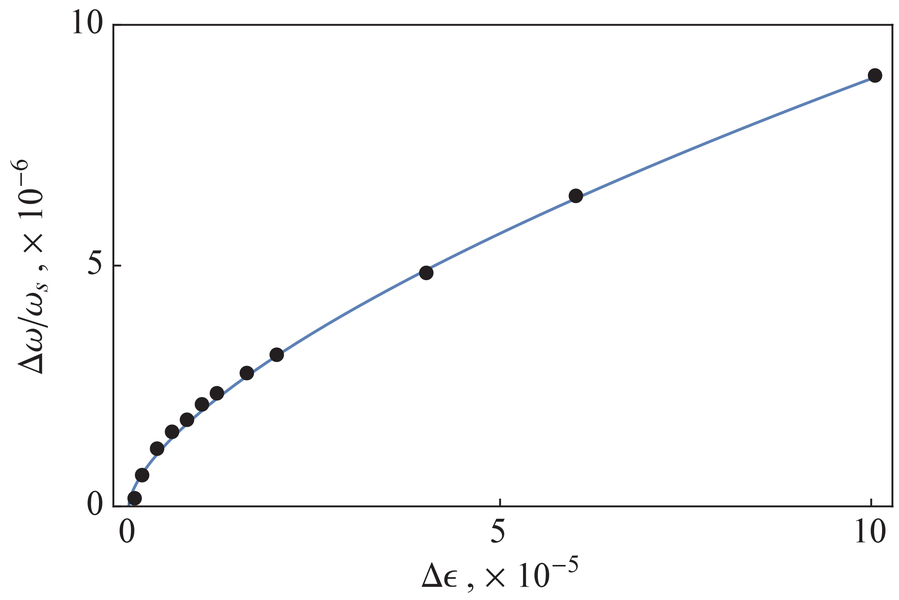


Analyte induced perturbation breaks exceptional point degeneracy:

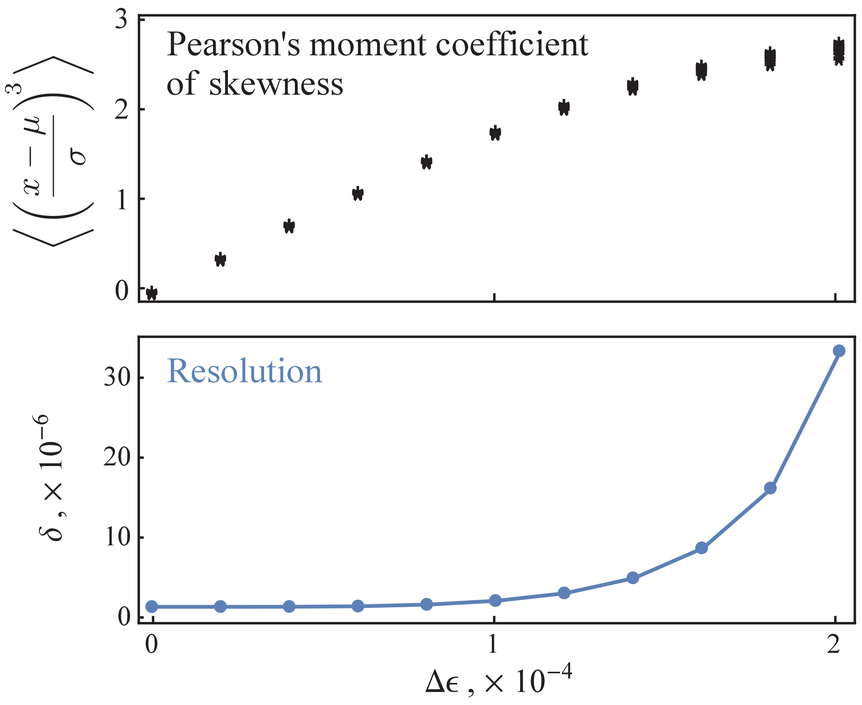


Sensing performance

Frequency splitting depends strongly on perturbation:



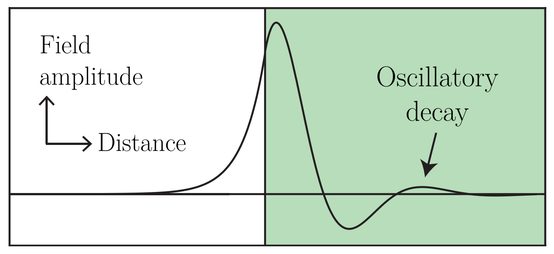
Spectrum asymmetry can be used instead of frequency peaks:



which gives high resolution and robustness against noise.

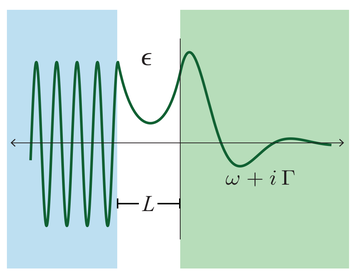
Exceptional point from ghost wave interaction

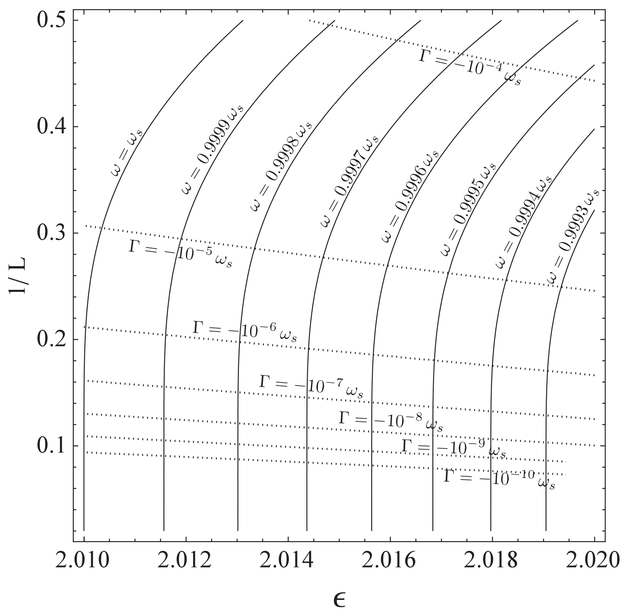
Ghost waves are non-uniform electromagnetic waves that decay with oscillations in biaxial material:



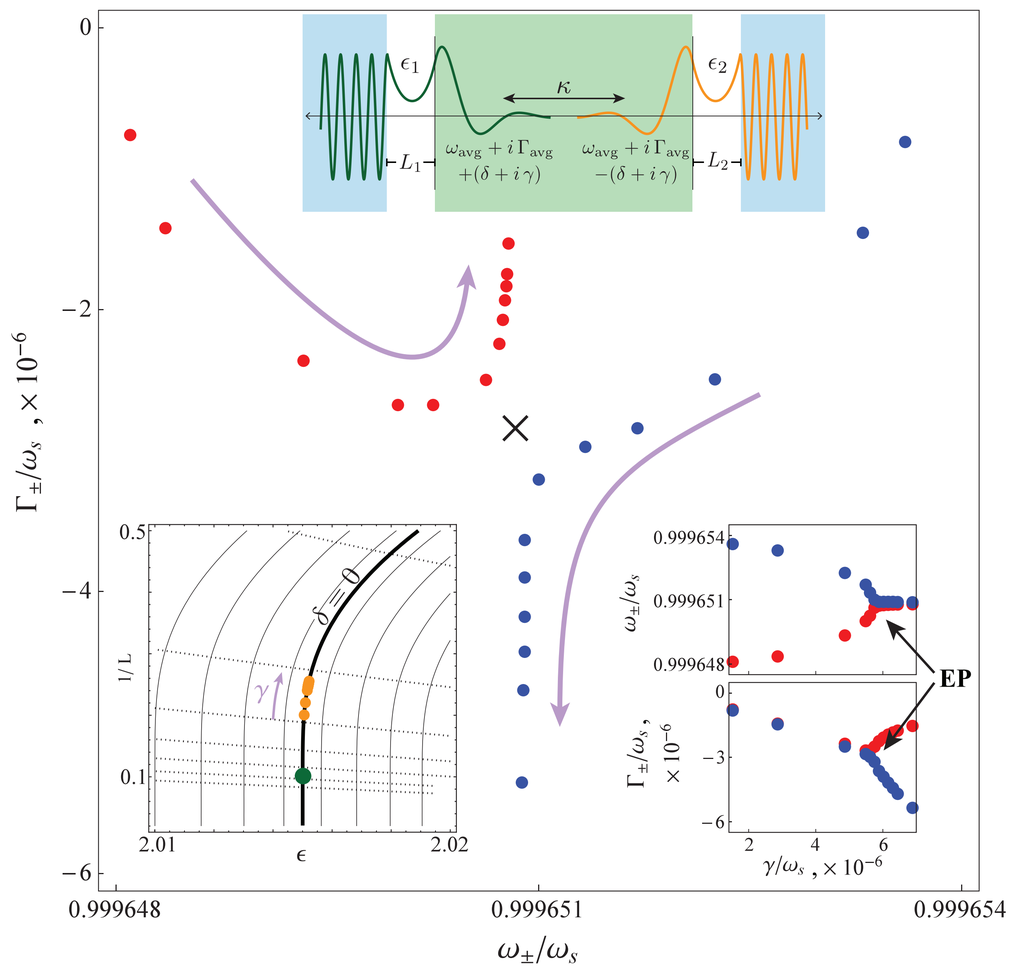
Ghost surface wave

"Half" of sensor supports quasi-guided ghost mode with a controllable frequency & decay:

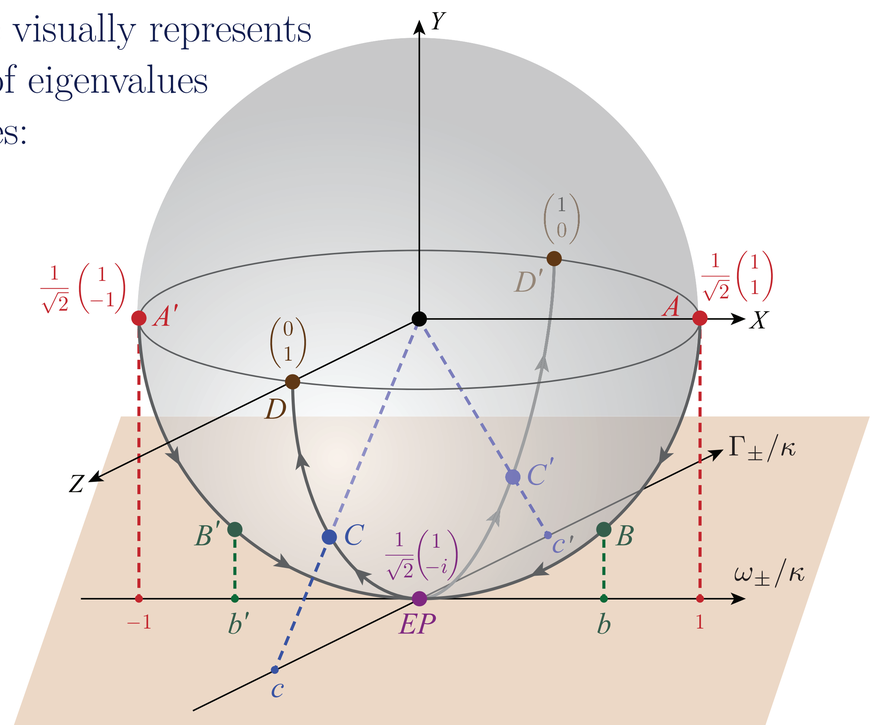




Control helps two such interacting "halves" reach exceptional point:



Bloch sphere visually represents coalescence of eigenvalues & eigenmodes:



Takeaway: Ghost wave offers exceptional point-based sensing in planar geometry