

# Non-Hermitian Effects in Thin Film X-Ray Cavities: Exceptional Points

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Non-Hermitian Hamiltonians allow for an effective description of dissipative systems. They exhibit a variety of exciting phenomena that cannot be observed in the Hermitian realm. Exceptional Points (EPs) are a prime example of this. At EPs not only the complex eigenvalues, but also the eigenvectors coalesce and sensitivity to perturbations is drastically enhanced. This concept has recently found fertile ground in optics and photonics where non-Hermitian eigenstates can be created and superposed through optical gain and loss [1]. So far, these concepts have been mostly discussed in the optical regime. Similar control of X-rays is desirable due to their superior penetration power, high focusability and detection efficiency.

Here, we investigate theoretically non-Hermitian X-ray photonics in a thin-film cavity setup containing Mössbauer nuclei resonant to the X-ray radiation entering under grazing incidence. These cavities present loss that can be controlled via adjustment of the cavity geometry and the incidence angle of the X-rays [2]. Application of a magnetic hyper-fine field paves the way to tune the system towards EPs and to explore their rich topological properties.

## References

- [1] L Feng, R El-Ganainy and L Ge, *Nat. Photonics* **11**, 752 (2017)
- [2] X Kong, D E Chang and A Pálffy, *Phys. Rev. A* **102**, 033710 (2020)