

## PT -SYMMETRIC OSCILLATORS WITH ONE-CENTER POINT INTERACTIONS

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We investigate the spectrum of Schrödinger operators with imaginary polynomial potentials in  $L^2(\mathbb{R})$ , perturbed with  $\delta$ , or  $\delta'$  interaction, centered at the origin  $(1) -\partial^2 x + ix^{2k-1} + \alpha\delta, -\partial^2 x + ix^{2k-1} + \beta\delta'$ , where  $\alpha \in \mathbb{R}, \beta \in \mathbb{R}, k \in \mathbb{N}$ . It is well established that the spectrum of the unperturbed operators consists of countable many real, isolated and simple eigenvalues for  $k \geq 2$ , and it is empty for  $k = 1$ . When  $\alpha \neq 0$  or  $\beta \neq 0$ , for  $k \geq 1$ , we observe countable many non-real eigenvalues appearing in complex conjugate pairs, and at maximum finitely many real eigenvalues. The non-real eigenvalues asymptotically converge to the eigenvalues of the unperturbed problems defined on  $L^2(\mathbb{R}_+)$  and  $L^2(\mathbb{R}_-)$  with Dirichlet, resp. with Neumann boundary conditions for  $\delta$ , resp.  $\delta'$  interaction. Moreover, for  $\alpha \leq Ck < 0$ , we show the existence of negative real eigenvalue, diverging to  $-\infty$  as  $\alpha \rightarrow -\infty$ .

### References

- [1] J. Behrndt, I. Semorádová, P. Siegl, The imaginary Airy operator with one-center  $\delta$  interaction, to appear in Pure and Applied Functional Analysis
- [2] M. Marletta, I. Semorádová, PT -symmetric oscillators with one-center point interactions manuscript in preparation