Solutions with mixed positive and negative spikes for some semilinear elliptic problems.

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We consider the following stationary nonlinear Schrödinger equation

$$-\varepsilon^2 \Delta v + v = f(v) \quad \text{in } \Omega, \tag{1}$$

where Ω is a smooth and bounded domain of $\mathbb{R}^N$, ε is a small positive parameter, f is a superlinear, subcritical and odd nonlinearity. No geometrical or topological assumption on Ω is required. We discuss some recent results concerning concentration phenomena for sign-changing solutions in the semiclassical limit $\varepsilon \to 0^+$ ([1]-[2]). More specifically, we explain the construction of solutions consisting of mixed positive and negative interior peaks for the Dirichlet and the Neumann problems associated to (1). The peaks approach separate points of Ω and their location depends on the geometry of the domain.

References

[1] T. D'Aprile. *Solutions with many mixed positive and negative interior spikes for a semilinear Neumann problem*, Calc. Var. Partial Differential Equations **41** (2011), 435–454.

[2] T. D'Aprile, A. Pistoia. *Nodal solutions for some singularly perturbed Dirichlet problems*, Trans. Amer. Math. Soc. **363** (2011), 3601–3620.