Blowing-up solutions for a nonlocal Liouville type equation in a union of intervals

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We consider the nonlocal Liouville type equation \((-\Delta)^\frac{1}{2} u = \varepsilon \kappa e^u\) in the union of disjoint bounded intervals, coupled with homogeneous Dirichlet exterior data. Here, \(\kappa\) is a smooth bounded function with positive infimum and \(\varepsilon > 0\) is a small parameter. For any integer \(m \in \{1, d\}\), we construct a family of solutions \(\{u_\varepsilon\}\) which blows up at \(m\) distinct interior points of \(I\) and for which \(\varepsilon \int_I \kappa e^{u_\varepsilon} \, dx \to 2m\pi\) as \(\varepsilon \to 0^+\). Moreover, we show that, when \(d = 2\) and \(m\) is suitably large, no such construction is possible.

The talk is based on a joint work with Antonio J. Fernández (ICMAT, Madrid).