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 I of $d \geqslant 2$ disjoint bounded intervals, coupled with homogeneous Dirichlet exterior data. Here, κ 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 $\varepsilon \searrow 0$. 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).