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Rigidity of non-compact static domains in hyperbolic space via positive mass theorems

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Abstract. We single out a notion of staticity which applies to any domain in hyperbolic space whose boundary is a non-compact totally umbilical hypersurface. For (time-symmetric) initial data sets modeled at infinity on any of these latter examples, we formulate and prove a positive mass theorem in the spin category under natural dominant energy conditions (both in the interior and along the boundary) whose rigidity statement retrieves, among other things, a sharper version of a recent result by Souam [33] to the effect that no such hypersurface admits a compactly supported deformation keeping the original lower bound on the mean curvature. A key ingredient in our approach is the consideration of a family of elliptic boundary conditions on spinors interpolating between chirality and MIT bag boundary conditions.

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