

## On the Support of Minimizers of Causal Variational Principles on the Sphere

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Special session: Energy-minimizing point configurations and measures

As an approach for formulating relativistic quantum field theory, causal variational principles have been proposed in [1]. In one setting, the aim of such causal variational principles is to minimize an action defined as the double integral of special non-negative functions (so-called *Lagrangians*) within the class of regular Borel probability measures on the two-sphere. We show that depending on the chosen Lagrangian, minimizers of these principles either satisfy certain properties (we call these minimizers *generically timelike*) or else have singular support (see [2]). In the latter case, it can be proven that the support of every minimizing measure is contained in a finite number of smooth curves which intersect at a finite number of points, or that the support has Hausdorff dimension at most  $6/7$  (see [3]). Numerical results supplement our investigations.

[1] Felix Finster, *The Continuum Limit of Causal Fermion Systems*, Fundamental Theories of Physics, vol. 186, Springer, 2016.

[2] F. Finster, D. Schiefeneder, *On the support of minimizers of causal variational principles*, Arch. Ration. Mech. Anal. 210 (2013), no. 2, 321-364.

[3] L. Bäuml, F. Finster, H. von der Mosel, and D. Schiefeneder, *Singular support of minimizers of the causal variational principle on the sphere*, Calc. Var. Partial Differential Equations 58 (2019), no. 6, 205.