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Studies of the energy-momentum tensor in extreme-instability systems[1] FILIP BERGABO, University of Connecticut, MICHAEL CANTARA, Massachusetts Institute of Technology, MANUEL MAI, Yale University, PETER SCHWEITZER, University of Connecticut — The D-term is, like mass and spin, a fundamental property related to the energy-momentum tensor. Yet it is not known experimentally for any particle. In all theoretical studies so far the D-terms of various particles were found to be negative. Early works gave rise to the assumption that the negative sign could be related to stability. The emerging question is whether it is possible to find a field-theoretical system with a positive D-term. To shed some light on this question we investigate Q-clouds, an extreme parametric limit in the Q-ball system. Q-clouds are classically unstable solutions which delocalize, spread out over all space forming an infinitely dilute gas of free quanta, and are even energetically unstable against tunneling to plane waves. These extremely unstable field configurations provide an ideal candidate system for our purposes. By studying the energy-momentum tensor we show that at any stage of the Q-cloud limit one deals with perfectly well-defined and, when viewed in appropriately scaled coordinates, non-dissipating non-topological solitonic solutions. In particular, we show that Q-cloud solutions have negative D-terms, indicating that it is unlikely to realize a positive D-term in a consistent physical system.

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Michael Cantara
Massachusetts Institute of Technology

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