



Ultraviolet singularities in classical brane theory

<http://www.firstlight.cn> 2010-11-30

We construct for the first time an energy-momentum tensor for the electromagnetic field of a p-brane in arbitrary dimensions, entailing finite energy-momentum integrals. The construction relies on distribution theory and is based on a Lorentz-invariant regularization, followed by the subtraction of divergent and finite counterterms supported on the brane. The resulting energy-momentum tensor turns out to be uniquely determined. We perform the construction explicitly for a generic flat brane. For a brane in arbitrary motion our approach provides a new paradigm for the derivation of the, otherwise divergent, self-force of the brane. The so derived self-force is automatically finite and guarantees, by construction, energy-momentum conservation.

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