

Quasi-local mass of weak gravitational field

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The widely accepted ADM expression for the energy of an asymptotically flat spacetime satisfies a “natural” consistency test - its second variation is equal to the canonical hamiltonian functional for linearized gravity on a Minkowski background. A viable quasi-local mass candidate should possess a similar property, namely - its second-order approximation should equal the hamiltonian of the well-understood linearized theory. We show that the Hawking quasi-local mass passes this test, provided that certain gauge conditions are fulfilled. We believe that these gauge conditions may actually carry a physical meaning - they provide a suggestion about the way the problem of quasi-local energy should be posed.

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