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Gravitational form factor of soliton in 1+1 dimensional ϕ^4 model

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It is known that 1+1 dimensional real scalar models with a negative mass squared have a soliton solution called the kink. We analyze the distribution of the energy-momentum tensor around the kink by incorporating the quantum correction up to leading order. The Fourier transform of the distribution corresponds to the gravitational form factors. We employ the collective coordinate method which deals with the soliton's coordinate as a dynamical variable. The zero mode that gives rise to the infrared divergence is eliminated in this method. The ultraviolet divergences in the quantum correction are removed by the vacuum subtraction with the prescription called the mode-number cutoff and the mass renormalization. We obtain the result consistent with the energy-momentum conservation. The spatial integral of the energy density agrees with the known result on the total energy of the soliton.

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