

# Gradient Flow Exact Renormalisation Group for Scalar Quantum Electrodynamics

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We apply the gradient flow exact renormalisation group (GFERG) for scalar quantum electrodynamics. The flow equations for the Wilsonian effective action is derived by means of perturbative expansion in the gauge coupling. In this work, we deal with quantum corrections to the correlation functions up to second order of the gauge coupling. We demonstrate especially that the GFERG formalism actually respects the gauge invariance in sense that the anomalous dimension of the gauge field agrees with the standard perturbative computation and the mass of the photon keeps vanishing in general spacetime dimensions. The latter is a noteworthy fact which contrasts with the conventional exact renormalisation group formalism in which an artificial photon mass proportional to a cutoff scale is induced. These results may therefore imply the ability of the GFERG formalism as a gauge-invariant renormalisation group flow.

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