

Regularized interacting quantum field theories

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We consider self interacting scalar quantum field theories over a d dimensional Minkowski spacetime with various interaction Lagrangians which are suitable functions of the field. The interacting field observables are represented as power series over the free theory by means of perturbation theory. We discuss a regularization procedure which makes the perturbative series convergent. In particular, the S matrix converge to well defined unitary operator. This regularization on two parameters. One describes how much the high frequency contributions in the propagators are tamed and a second one which describes how much the large field contributions are suppressed in the interaction Lagrangian.

We finally discuss how to remove the parameters in lower dimensional theories and for specific interaction Lagrangians. In three spacetime dimensions for a ϕ^4_3 theory one obtains sequences of unitary operators which are weakly-* convergent to suitable unitary operators in the limit of vanishing parameters. The coefficients of the asymptotic expansion in powers of the coupling constant of all the possible limit points coincide and furthermore agree with the predictions of perturbation theory. We discuss how to extend these results to other cases.