

## Heat Kernel methods in simple renormalizable systems

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Attractive delta function potential in two dimensions is a simple example of a quantum mechanical system which requires renormalization. We study this example on general two dimensional manifolds. We show that the heat kernel techniques are most suitable to understand various aspects of this problem. We review some results related to the heat kernels on manifolds, and use them to show that the spectrum is bounded from below. A similar problem in field theory is the so called Lee model. We study a nonrelativistic version of the Lee model following ideas suggested by Rajeev on 3 dimensional manifolds. The relativistic version in 2 dimensions is analyzed using heat kernel techniques and we show that the spectrum is bounded from below for all particle sectors.