Curvature contribution to the essential spectrum of Dirac operators with critical shell interactions

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This talk is devoted to the characterization of the essential spectrum of three-dimensional Dirac operators with critical combinations of electrostatic and Lorentz scalar shell interactions supported on a smooth compact surface.

After giving the rigorous definition and basic spectral properties of the perturbed operator, we show that its essential spectrum within the gap of the free Dirac operator is nonempty and depends on the surface geometry. More precisely, we show that the criticality of the interaction leads to a new interval of the essential spectrum whose position and length are explicitly controlled by the coupling constants and the principal curvatures of the surface, reducing to a single point only in the case of a sphere.

This work was carried out jointly with Konstantin Pankrashkin (Carl von Ossietzky Universität Oldenburg).