



MAFIA - the seminar you can't refuse

Non-self-adjoint relativistic point interactions and their approximations by non-local potentials

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Abstract: In this talk we will look at the Dirac operator with a non-local potential given by the projection on a fixed scaled function from $L^2(\mathbb{R}) \cap L^1(\mathbb{R})$ multiplied by a complex matrix \mathbb{A} . We will find the norm-resolvent limit of this not necessarily self-adjoint operator. Furthermore, the rigorous expression for the norm resolvent limit will be compared to the formal limit of the Dirac operator with the non-local potential. This procedure proved itself to be problematic when a local potential was originally considered instead of a non-local one since then the formal limit and the norm-resolvent limit are not the same [1, 2, 3, 4]. This phenomena is known as a renormalization of coupling constants. We will see that this problem does not occur when using the non-local potential. Consequently, we will naturally extend the definition of the operator of the relativistic point interaction to the non-self-adjoint setting. We will find an exact formula for the resolvent of this newly defined operator. Moreover, the spectrum of this operator will be discussed. We will point out remarkable spectral transitions for special cases of the relativistic point interaction. Finally, we will try to explain the spectral transitions by examining ϵ -pseudospectrum of the operator.

REFERENCES

- [1] P. Šeba, *Klein's Paradox and the Relativistic Point Interaction*. Letters in Mathematical Physics 18, 1989, 77-86.
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