Minisymposium 15 - Operatortheorie

Estimates for the eigenvalues of the angular part of the Dirac equation in the Kerr-Newman metric

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The radial part of the Dirac equation describing a fermion in the Kerr-Newman background metric has an operator theoretical realisation as a block operator matrix $\mathcal{A} = \left(\begin{smallmatrix} -D & B \\ B^* & D \end{smallmatrix}\right)$ with domain $\mathcal{D}(\mathcal{A}) = \mathcal{D}(B^*) \oplus \mathcal{D}(B)$ in the Hilbert space $\mathcal{H} = L_2(0,\pi)^2$. It can be shown that the spectrum of $\mathcal{A}$ consists of eigenvalues only. We will show that the expression $\mathcal{A} - \lambda$ allows for a factorisation into three factors such that all the information about the spectrum of $\mathcal{A}$ is contained in a scalar operator valued function. From this function we obtain a lower bound for the smallest eigenvalue in modulus of $\mathcal{A}$. Another method to obtain such a bound is to use techniques related to the quadratic nuermical range of block operator matrices.