

# First order systems of partial differential equations on manifolds without boundary

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## SUMMARY

The talk deals with formally self-adjoint systems of first order linear partial differential equations on manifolds without boundary. We study the distribution of eigenvalues in the elliptic setting and the propagator in the hyperbolic setting, deriving two-term asymptotic formulae for both.

We then turn our attention to the special case of a system of two equations in dimension four. We show that the geometric concepts of Lorentzian metric, Pauli matrices, spinor field, connection coefficients for spinor fields, electromagnetic covector potential, Dirac equation and Dirac action arise naturally in the process of our analysis.

The talk is based on the papers [1, 2, 3, 4, 5, 6].

**Keywords:** Spectral theory, Dirac equation.

**AMS Classification:** Primary 35P20; Secondary 35J46, 35R01, 35Q41.

## References

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