

Wick rotation in the lapse: admissible complex metrics and the Wick rotated heat kernel

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A Wick rotation in the lapse (not in time) is introduced for foliated metric geometries. This interpolates between Lorentzian and Riemannian metrics on the same underlying smooth real manifold, passing through “admissible” complex metrics dampening the exponential of the action of a real scalar field. Moreover, strictly away from the Lorentzian metric, the associated Laplace-Beltrami operator generates a “Wick rotated heat semigroup”, an analytic semigroup generalizing the usual heat semigroup on a Riemannian manifold. I will discuss the properties of the Wick rotated heat semigroup, including: (i) existence and uniqueness, (ii) the existence and uniqueness of an integral kernel, the “Wick rotated heat kernel”, (iii) the kernel’s diagonal admits a small semigroup time asymptotic expansion, and (iv) when the d’Alembertian of the Lorentzian metric is essentially self-adjoint, the Wick rotated heat semigroup converges to the unitary Schrödinger group generated by the d’Alembertian in the strict Lorentzian limit. This talk is based on joint work with Max Niedermaier.

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