

Ecole Doctorale des Sciences Fondamentales

Title of the thesis: The noncommutative residue and the Debord-Skandalis action

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Summary :

The noncommutative residue, or Wodzicki residue [1], is the unique trace functional on the algebra of classical pseudodifferential operators. It has numerous equivalent definitions, such as the residue of a spectral zeta function, or the integral of the term of critical order in the asymptotic expansion of the complete symbol of a pseudodifferential operator.

The goal of this project is to realize the noncommutative residue via the recent groupoid characterization of pseudodifferential operators due to Debord and Skandalis [2]. The general nature of the groupoid approach should give rise to residue traces on many other algebras of operators, such as the noncommutative residues of Ponge on CR manifolds [3], or algebras associated to Hörmander's sums of squares operators.

The results should also be connected to the noncommutative residue in the Melin calculus constructed by Dave-Haller using heat kernel methods [4].

References:

- [1] M. Wodzicki, Noncommutative residue: Chapter I. Fundamentals.
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- [2] C. Debord and G. Skandalis, Adiabatic groupoid, crossed product by R^* and pseudo-differential calculus, *Adv. Math.*257 (2014), 66–91.
- [3] R. Ponge, Noncommutative residue invariants for CR and contact manifolds.
J. Reine Angew. Math. 614 (2008), 117–151.
- [4] Dave, Shantanu; Haller, Stefan The heat asymptotics on filtered manifolds.
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