

Analytic torsion of the Rumin complex on filtered 5-manifolds with growth vector (2,3,5)

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We consider a closed filtered 5-manifold with growth vector (2,3,5), that is, the 5-manifold comes equipped with a bracket generating rank two subbundle in the tangent bundle. The associated Rumin complex is a hypoelliptic complex of higher order differential operators computing the deRham cohomology. Using a sub-Riemannian metric we obtain higher order Hodge-Laplace-type operators that are similar to the operators considered by Rumin and Seshadri on contact manifolds. These Laplacians admit parametrices in the Heisenberg calculus and their zeta functions extend to meromorphic functions on the entire complex plane which are holomorphic at zero. This permits to define an analytic torsion of the Rumin complex using zeta-regularized determinants of said Laplacians.

In this talk we will discuss qualitative results for the analytic torsion of the Rumin complex. In particular, we will address the dependence on the geometry, i.e., the sub-Riemannian metric and the rank two subbundle. We will also present a first comparison with the Ray--Singer torsion for certain nilmanifolds.

One motivation for studying this analytic torsion is the question: To what extent do distributions with growth vector (2,3,5) abide by an h-principle?