

Proper actions of Lie groups and numeric invariants of Dirac operators

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I shall explain how to define and investigate primary and secondary invariants of G -invariant Dirac operators on a cocompact G -proper manifold, with G a connected real reductive Lie group. This involves cyclic cohomology and K -theory. After treating the case of cyclic cocycles associated to elements in the differentiable cohomology of G I will move to delocalized cyclic cocycles; in particular, I will explain the challenges in defining the delocalized eta invariant associated to the orbital integral defined by a semisimple element g in G and in showing that such an invariant enters in an Atiyah-Patodi-Singer index theorem for cocompact G -proper manifolds. I will then consider a higher version of these results, based on the Song-Tang higher orbital integrals associated to a cuspidal parabolic subgroup P_1G with Langlands decomposition $P=MAN$ and a semisimple element g in M . This talk is based on articles with Hessel Posthuma and with Hessel Posthuma, Yanli Song and Xiang Tang.