K-types of tempered representations

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Summary

Tempered representations of a Lie group G are the irreducible unitary representations one needs in the Plancherel decomposition of $L^2(G)$. They are relevant to harmonic analysis because of this, and also occur in the Langlands classification of the larger class of admissible representations. If $K \subset G$ is a maximal compact subgroup, then there is a considerable amount of information in the restriction of a tempered representation to K. In joint work with Yanli Song and Shilin Yu, we give a geometric expression for the decomposition of such a restriction into irreducibles. The multiplicities of these irreducibles are expressed as indices of Dirac operators on reduced spaces of a coadjoint orbit of G corresponding to the representation. These reduced spaces are Spin-c analogues of reduced spaces in symplectic geometry, defined in terms of moment maps that represent conserved quantities. This result involves a Spin-c version of the quantisation commutes with reduction principle for noncompact manifolds. For discrete series representations, this was done by Paradan in 2003.

Orateur: M. HOCHS, Peter