Department of Mathematics Seminar

Galois Module Structure and Hilbert-Blumental Varieties

By

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Abstract: The works of Chinburg and of Chinburg, Erez, Pappas and Taylor ([2], [3]) generalize Fröhlich's conjecture by relating the ε-constants with the Galois modules attached to a group action on an arithmetic scheme. It turns out that one can consider more general equivariant projective Euler characteristics: Suppose that X is a scheme projective and flat over Z which supports a tame action of the finite group G. For any coherent sheaf F on X which supports a G-action that is compatible with the action of G on X one can define following Chinburg [1] the equivariant projective Euler characteristics $\chi(X, F) \in Cl(Z[G])$. The calculation of these Euler characteristic often connects to other fundamental problems in Number Theory. A new method, developed by Chinburg, Pappas and Taylor in [4], shows how to calculate the Euler characteristic of coherent sheaves on projective at schemes over Z on which finite group acts. In particular, they determined the structure of the lattice of weight 2 cusp forms for Γ(p) which have integral Fourier expansions as a module for the action of the finite group of diamond Hecke operators. This is done by calculating the equivariant Euler characteristic $\chi(X, OX)$ where X is a certain integral model of the modular curve X1(p). In this talk, we will introduce the results of [5]: The Writer calculates the equivariant Euler characteristics of powers of the canonical sheaf on certain modular curves over Z which have a tame action of a finite abelian group which produces information on the Galois module structure of modular forms of even weight having Fourier coefficients in certain ideals of rings of cyclotomic algebraic integers. Moreover, we mention about special type of Hilbert-Blumental surfaces [6] on which we want to extend results.

References:

[1] T. Chinburg:Galois structure of de Rham cohomology of tame covers of schemes, Annals of Math., 139 (1994), 443490. Corrigendum, Annals of Math., 140 (1994), 251.
[2] T. Chinburg, B. Erez, G. Pappas, M. J. Taylor: ε-constants and the Galois structure of de Rham cohomology, Annals of Math. 146 (1997), 411-473.
[3] T. Chinburg, G. Pappas, M. J. Taylor: ε-constants and the Galois structure of de Rham cohomology 2, J. Reine Angew. Math. 519 (2000), 201-230.
[4] T. Chinburg, G. Pappas, M. J. Taylor: Cubic Structures, Equivariant Euler Characteristics and Lattices of Modular Forms, submitted.
[5] E. Gurel: Galois structure of modular forms of even weight. Journal of Number Theory. pp. 2274 – 2288, 2009.
[6] G. Pappas: Arithmetic models for Hilbert modular varieties, Compoitio Mathematica. pp. 43-76 1995.

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