

Cohomology of Bianchi Groups

Haluk Şengün

Max Planck Institute - Bonn

Bianchi groups are groups of the form $SL(2, R)$ where R is the ring of integers of an imaginary quadratic field. They arise naturally in the study of hyperbolic 3-manifolds and of certain generalizations of the classical modular forms (called Bianchi modular forms) for which they assume the role of the classical modular group $SL(2, \mathbb{Z})$. In this latter sense, the study of Bianchi groups is fundamental for developing Langlands' programme for $GL(2)$ beyond totally real fields.

The overall goal of this talk is to give the audience an overview of some of the fundamental problems in the arithmetic aspects of the theory of Bianchi groups. After giving the necessary background, I will start with a discussion of the problem of understanding the behavior of the dimensions of the cohomology of Bianchi groups and their congruence subgroups. Next, I will focus on the amount of the torsion that one encounters in the cohomology. Finally, I will discuss the arithmetic significance of these torsion classes.