CHIRAL DE RHAM COMPLEX AND MODULAR FORMS

Speaker: Xuanzhong Dai
Shanghai Center for Mathematical Sciences

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Abstract: For any congruence subgroup Γ, we study the vertex operator algebra $\Omega^{ch}(\mathbb{H},\Gamma)$ constructed from the Γ-invariant global sections of the chiral de Rham complex on the upper half plane, which are holomorphic at all the cusps.

We introduce an $\mathrm{SL}(2,\mathbb{R})$-invariant filtration on the global sections and show that the Γ-invariants on the graded algebra is isomorphic to certain copies of modular forms.

We also give an explicit formula for the lifting of modular forms to $\Omega^{ch}(\mathbb{H},\Gamma)$ and compute the character formula of $\Omega^{ch}(\mathbb{H},\Gamma)$. Furthermore, we show that the vertex algebra structure modifies the Rankin-Cohen bracket, and the modified bracket becomes non-zero between constant modular forms involving the Eisenstein series.