The Hong Kong University of Science and Technology

Department of Mathematics

PhD THESIS EXAMINATION

Chiral De Rham Complex on the Upper Half Plane and Modular Forms

By

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ABSTRACT

In this thesis, we introduce an $SL(2,\boldsymbol{R})$-action on the chiral de Rham complex on the upper half plane, and study the vertex subalgebra of Γ-invariant global sections, which are holomorphic at all the cusps. The thesis can be divided into three parts. The first part includes a recollection on the theory of vertex algebras and modular forms. The second part consists of a brief review of the construction of chiral de Rham complex by Malikov, Schechtman and Vaintrob, which will be applied to the upper half plane. We consider the vertex algebra associated to an arbitrary congruence subgroup Γ, and compute its character formula. We also give an explicit formula for the lifting of modular forms to the invariant sections, and the lifting formula is essentially unique and universal. The last part discusses the relations between the generalized Rankin-Cohen bracket and the elements in the global sections, and some further properties about the vertex algebra.

Date: 15 July 2020, Wednesday

Time: 2:00 p.m.

ZOOM Meeting: https://hkust.zoom.us/j/9063102107?pwd=MnVPZ25zY0YwWFJqV29FZEE5dGRxdz09

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