

Polyakov Path Integral as Modular Parametrization (?): CM Elliptic Curves as Target Spaces

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An L-function is defined for an algebraic variety with defining equations written only with algebraic numbers as coefficients. For some classes of such varieties, a correspondence between those L-functions and modular forms has been observed as pure mathematics. It is a natural question whether the modular transformation in $g=1$ string-theory amplitudes has something to do with this phenomenon.

We argue for the class of varieties called elliptic curves of Shimura type (implying complex multiplication) that the modular transformation can indeed be regarded as that of the $g=1$ world sheet, and that certain class of $g=1$ correlation functions yield functions on the complex upper half plane, just like the theory of modular parametrization does. Roles played by choice of the target space metric, arithmetic model dependence, and the needs for average within the ideal class group will also be discussed along the way.

This presentation is based on two joint works with Satoshi Kondo:
<https://arxiv.org/abs/1912.13294> and <https://arxiv.org/abs/1801.07464>

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