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Mathieu moonshine and the elliptic genus of K3

It has recently been conjectured by Eguchi, Ooguri and Tachikawa that the elliptic genus of K3 can be written in terms of dimensions of Mathieu group M24 representations. We provide explicit formulae for the corresponding twining characters and verifying that they satisfy the expected modular properties. This allows us to identify the decomposition of all expansion coefficients in terms of dimensions of M24-representations. For the first 500 coefficients we verify that the multiplicities are indeed all non-negative integers. This represents very compelling evidence in favour of the conjecture.

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