



Department of
Theoretical Physics

THE QUANTUM SPACETIME SEMINAR SERIES

Applications of Mathieu Moonshine in $\mathcal{N}=4$ supersymmetric theories

Aradhita Chattopadhyaya

(IISc Bangalore)

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We study the properties of $1/4$ BPS dyons in $\mathcal{N}=4$ type II string compactified on $K3 \times T^2$ orbifolded with an action of automorphism g' of $K3$ corresponding to the conjugacy classes of Mathieu group M_{24} and a $1/N$ shift in one of the circles of T^2 .

The partition function of dyons in these compactifications are given in terms of inverse of Siegel modular forms constructed from the lift of the twisted elliptic genus. The sign of the supersymmetric index counting $1/4$ BPS dyons agrees with that predicted from black hole physics as conjectured by Sen. We also study the properties of $1/4$ BPS dyons in type II string theory compactified on \mathbf{Z}_2 and \mathbf{Z}_3 orbifolds on T^6 with $1/N$ shift in one of the S^1 and encounter some violations to this conjecture. These point to the existence of possible non-trivial hair modes for $1/4$ BPS dyons in these theories. We associate mock modular forms corresponding to single centred black holes and extend the work of Dabholkar-Murthy-Zagier to these orbifolds of $K3$ and also for the toroidal orbifolds.