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Elliptic CY 3-fold, refined BPS states and weak Jacobi Forms

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We show that the all genus BPS on compact elliptically fibered Calabi-Yau manifolds can be written in terms of meromorphic Jacobi forms whose weight grows linearly and whose modular index grows quadratically with the base degree. If a suitable defined geometric index of a curve class in the base is negative the corresponding 6d theory can be solved completly. This solves e.g. the BPS spectrum of the E-string and related 6d theories.

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