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Massive string towers, level crossing, and black hole attractors

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Using numerical approximations to the Ricci-flat CY metric, it has become possible to compute higher eigenmodes of the scalar Laplacian, which correspond to massive towers of states. It has been observed that these towers become heavier or lighter as one traverses the CY moduli space, and that eigenmodes cross along codimension 1 loci. This begs the question whether there is something special about these crossing points. To shed light on this, we study simple one-parameter families of CYs in various dimensions. For tori, analytic solutions are possible, which shows an interesting relation between level crossings and number theory. We also use these toy models to assess the quality and the main sources of error for our numeric spectrum approximations. Armed with these results, we speculate about generalizations of our observations to more general CY manifolds.

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