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Low-lying zeros of elliptic curve L -functions: Beyond the ratios conjecture

We study the low-lying zeros of L -functions attached to quadratic twists of a given elliptic curve E defined over \mathbb{Q} . We are primarily interested in the family of all twists coprime to the conductor of E and compute a very precise expression for the corresponding one-level density. In particular, for test functions whose Fourier transforms have sufficiently restricted support, we are able to compute the one-level density up to an error term that is significantly sharper than the square-root cancellation predicted by the L -functions Ratios Conjecture. This is joint work with Daniel Fiorilli and Anders Södergren.