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The arithmetic of the adjoint of a weight one modular form

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Darmon, Lauder and Rotger have formulated different conjectures involving the so-called p-adic iterated integrals attached to a triple (f,g,h) of classical eigenforms of weights (2,1,1). When f is a cusp form, it involves the p-adic logarithm of distinguished points on the modular abelian variety attached to f. However, when f is Eisenstein, they conjecture a formula involving the p-adic logarithms of units and p-units in suitable number fields, which can be seen as a variant of Gross'p-adic analogue of Stark's conjecture. In a joint work with V. Rotger we prove the conjecture when h is dual to g. The proof rests on Hida's theory of improved p-adic L-functions and Galois deformation techniques. Further, it suggests a tantalizing connection with the theory of Beilinson–Flach elements, in a setting where an exceptional vanishing of these cohomology classes emerges.

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