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Steven Sperber* (sperber@math.umn.edu), School of Mathematics, University of Minnesota, Minneapolis, MN 55455, and **Alan Adolphson** (adolphs@math.okstate.edu), Oklahoma State University, Department of Mathematics, Stillwater, OK 74078. *Hasse Invariants and Mod p Solutions of A -Hypergeometric Systems.*

The Hasse invariant of a family of elliptic curves defined over a finite field of characteristic p , distinguishes the ordinary curves in the family from the supersingular ones. Igusa noted that the Hasse invariant of the Legendre family of elliptic curves is a solution mod p of a Gauss hypergeometric differential equation. We consider general families of (twisted) exponential sums defined on the n -fold torus over the finite field; we define and give an algorithm for determining the Hasse invariant of the family; and we relate the Hasse invariant to a suitable sum of products of mod p solutions of A -hypergeometric systems. (Received July 24, 2014)