p-divisibility and unit-root formulas revisited

Steven Sperber (Univ. of Minnesota)

If N represents the number of points on a variety defined over a finite field of characteristic p, then the order of divisibility of N by p is an old question with results going back to Chevalley. In a recent result, Esnault-Katz study the question of whether the predicted divisibility of the Ax-Katz estimate applies as well to reciprocal zeros of each factor (in l-adic cohomology) of the zeta function of the variety. In joint work with Adolphson, we study the analogous question in p-adic cohomology, obtaining results in rigid cohomology which apply as well to the p-divisibility results of Adolphson-Sperber for exponential sums as well as the results of Ax and Katz. Dwork derived unit-root formulas for some nicely behaved families of varieties and exponential sums. For example, the unit root of the Kloosterman sum can be described using the p-adic Bessel function. In joint work with Adolphson, we explain this formula of Dwork using the standard generating function for the Bessel functions. This enables us to generalize Dwork's result.