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p-adic variation of L functions of exponential sums

ABSTRACT: Let $d > 2$ and let A^d be the space of degree-d monic polynomials over $\mathbb{Q}$ parametrizerd by their coefficients. For any polynomial f over $\mathbb{Z}_p$ and $\mathbb{Q}$ of degree d, let $L(f;T)$ be the L function of the exponential sum of $f(\bmod p)$. Let $NP(f,p)$ denote the Newton polygon of $L(f;T)$; and let $HP(A^d,p)$ be the Hodge polygon, which is the lower convex hull in the real plane $\mathbb{R}^2$ of the points $(n, n(n+1)/2d)$ for $n = 0 \ldots d-1$. We prove that for p large enough there exists a "generic Newton polygon" $GNP(A^d,p)$ and there is a Zariski dense open subset U defined over the rationals $\mathbb{Q}$ in A^d such that for all f in $U(\mathbb{Q})$ and for p large enough we have $NP(f,p) = GNP(A^d,p)$. Furthermore, as p goes to infinity their limit exists and is equal to $HP(A^d,p)$. The last statement was a conjecture of Daqing Wan.