Top Ehrhart coefficients of integer partition problems

For a given sequence \( \alpha = [\alpha_1, \alpha_2, \ldots, \alpha_N] \) of \( N \) positive integers, we consider the parametric integer partition problem \( \alpha_1 x_1 + \alpha_2 x_2 + \cdots + \alpha_N x_N = t \), where right-hand side \( t \) is a varying non-negative integer. It is well-known that the number \( E_\alpha(t) \) of solutions in non-negative integers \( x_i \) is given by a quasi-polynomial function of \( t \) of degree \( N \), the so called Ehrhart quasipolynomial function, very prominent in algebraic combinatorics. Computing the entire function \( E_\alpha(t) \) is known to be \#P-hard, and even deciding when the function vanishes is NP-hard. I present a new polynomial time algorithm that for a fixed number \( k \), we computes the highest \( k+1 \) coefficients of the quasi-polynomial \( E_\alpha(t) \) represented as step polynomials of \( t \). This is a nice applicatio of a natural poset on the set of possible gcd’s of subsets of numbers in \( \alpha \). To conclude, I present some applications to understanding the periodicity of \( E_\alpha(t) \) for some classical partition problems. This is joint work with V. Baldoni, N. Berline, M. Koeppe, and M. Vergne. (Received September 12, 2012)