1104-52-272 **Velleda Baldoni**, **Nicole Berline**, **Jesús A. De Loera**, **Matthias Köppe*** (mkoeppe@math.ucdavis.edu) and **Michèle Vergne**. *Real multi-parameter Ehrhart theory: Highest degree terms.*

We study sums $S(P(b), h)$ of polynomials h over the lattice points in multi-parameter polytopes $P(b) = \{ Ax \leq b \}$, where A is rational and $b \in \mathbb{R}^N$ is a *real* parameter vector. On every chamber, $S(P(b), h)$ is a generalized quasi-polynomial function of b, called the (weighted, real, multi-parameter) Ehrhart quasi-polynomial. It is a polynomial in variables b_i whose coefficients are periodic functions of the *real* parameters b_i. We give an algorithm for computing them in a certain closed form ("rational step-polynomials").

This extends to the case of intermediate sums, which interpolate between integrals and discrete sums. Similar to Barvinok (2006), we show that certain linear combinations of the intermediate Ehrhart quasi-polynomials give an approximation of the Ehrhart quasi-polynomial. This gives an algorithm for computing the coefficients of the terms of the highest k degrees in variables b_i. In various interesting settings for varying dimension but fixed k, it runs in polynomial time.

The results are proved on the level of multi-parameter generating functions. We study their bidegree structure and approximation. (Received September 02, 2014)