1086-11-2167 **Abhinav Kumar*** (abhinav@math.mit.edu), Department of Mathematics, Rm 2-169, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, MA 02139, and **Henry Cohn**, **Christian Reiher** and **Achill Schuermann**. *Formally dual configurations in Euclidean space and in abelian groups.*

The Poisson summation formula allows us to prove a relation between the theta function of a lattice and of its dual. A natural question is the following: are there periodic structures which are "formally dual", i.e. whose average theta functions are related by the same kind of relation? Examples of formally dual codes are known in the literature. We consider a stronger notion of formal duality: namely we say two periodic configurations $\mathcal{P}$ and $\mathcal{Q}$ in $\mathbb{R}^n$, each with one point per unit volume, are formal duals if for every Schwartz function f on $\mathbb{R}^n$, the average value of

$$E_f(x, \mathcal{P}) = \sum_{y \in \mathcal{P}, y \neq x} f(x - y)$$

over all $x \in \mathcal{P}$ is equal to the average value of $E_{\widehat{f}}(z, \mathcal{Q})$ over all $z \in \mathcal{Q}$.

Examples of such structures were observed in numerical experiments of energy minimization for periodic packings done by Cohn, Kumar and Schürmann. In this talk we present some new examples of formal duals, by first translating to the language of finite abelian groups. We also show that some familiar periodic configurations, such as the Best packing in 10 dimensions, do not have formal duals, at least in our stronger sense. (Received September 24, 2012)