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**Dmitriy Bilyk\*** (bilyk@math.gatech.edu), School of Mathematics, Georgia Institute of Technology, 686 Cherry Street, Atlanta, GA 30332-0160, and **Michael Lacey** and **Armen Vagharshakyan**. *The Small Ball Inequality and the Discrepancy Function in higher dimensions.*

We prove a non-trivial lower bound on the hyperbolic sums of Haar functions in dimension  $d \geq 3$ . The method of proof leads, in particular, to the new estimate on the Discrepancy Function:

$$\|D_N\|_\infty \gtrsim (\log N)^{\frac{d-1}{2}+\varepsilon}.$$

In dimension three, this builds up on the work of J.Beck and significantly improves his famous result. There has been no prior progress on the problem in dimensions four and higher. We also discuss connections of the inequality to Probability and Approximation Theory. (Received August 21, 2007)