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Small scale equidistribution of eigenfunctions on the torus

I will describe some recent results on the distribution of the L^2 -mass of eigenfunctions of the Laplacian on the torus $\mathbb{T}^d/2\pi\mathbb{R}^d$. A special case of a result of Marklof and Rudnick implies that the L^2 -mass of almost all such eigenfunctions equidistributes with respect to Lebesgue measure for $d = 2$. I will discuss results on the scales at which the L^2 -mass equidistributes, as well as mention some limitations on equidistribution, and relate these questions to arithmetic problems such as representing integers as sums of squares and the distribution of lattice points. This is joint work with Zeév Rudnick.