This talk is concerned with the inverse problem of recovering a discrete measure on the torus given a finite number of its noisy Fourier coefficients. We focus on the diffraction limited regime where at least two atoms are closer together than the Rayleigh length. We show that the fundamental limits of this problem and the stability of subspace (algebraic) methods, such as ESPRIT and MUSIC, are closely connected to the minimum singular value of non-harmonic Fourier matrices. We provide novel bounds for the latter in the case where the atoms are located in clumps. We also provide an analogous theory for a statistical model, where the measure is time-dependent and Fourier measurements are collected over at various times. Joint work with Wenjing Liao, Albert Fannjiang, Zengying Zhu, and Weiguo Gao.