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**Alan Haynes\*** (haynes@math.uh.edu) and **Jens Marklof**. *A five distance theorem for Kronecker sequences.*

The three distance theorem states that, if  $x$  is any real number and  $N$  is any positive integer, the points  $x, 2x, \dots, Nx$  modulo 1 partition the unit interval into component intervals having at most 3 distinct lengths. There are many higher dimensional analogues of this theorem. In this talk we will discuss a straightforward generalization to rotations on higher dimensional tori which, surprisingly, has been largely overlooked in the literature. For the two dimensional torus, we are able to prove a five distance theorem, which is best possible. In higher dimensions we also have bounds, but establishing optimal bounds is an open problem. Our proofs make use of reformulations of these problems in spaces of higher dimensional lattices, where we are able to bring in tools from dynamical systems and ergodic theory. (Received September 09, 2021)