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Kate Okikiolu* (okikiolu@math.ucsd.edu). *A negative mass theorem for the 2-torus.*

For a closed surface with a metric g , define $Z(1)$ to be the (regularized) trace of the inverse of the Laplacian. The “mass” is then the difference between the values of $Z(1)$ for g , and for the round sphere of the same area. This mass bears similarities both to the determinant of the Laplacian on surfaces, and to the ADM mass from general relativity. It is well known that on the 2 sphere, the mass is strictly positive for metrics which are not round. We discuss, on the other hand, a negative mass theorem which states that for a metric g on a 2-torus, there exists a conformal metric of negative mass. This negative mass metric is an almost spherical bubble with a worm hole joining the poles, which is interesting in light of the probabilistic interpretation of $Z(1)$. Although it is unknown whether this metric is a global minimum for the mass among metrics conformal to g with a fixed area, the negative mass theorem does imply the existence of such mass minimizers. (Received September 20, 2007)