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
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Torus fibrations on symplectic four-manifolds

Ivan Smith

Abstract: This paper has two essentially unrelated halves. In the first we prove that a closed symplectic four-manifold admitting a fibration by connected, homologically essential Lagrangian tori with "tame" singularities, is fibre-preserving diffeomorphic to a K3 surface or to a torus bundle over a torus with first Betti number at least three. In the second, we prove that these torus bundles over tori admit Lefschetz pencils by genus three curves. It follows that the genus three mapping class group admits infinitely many inequivalent irreducible positive relations. Motivations for the questions are provided from mirror symmetry, integrable systems and Seiberg-Witten theory: in particular we suggest that Seiberg-Witten invariants for symplectic manifolds may be determined by the homological monodromy of their Lefschetz pencils.

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