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Section:

6. Topology

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Casson invariant and surface singularities
Let Σ be the link of the singularity at 0 of the hypersurface $x^p + y^q + z^r = 0$. Assume that p, q, and r are relatively prime then Σ is a homology 3–sphere. Associated with the singularity are two manifolds, its canonical resolution, P, and its Milnor fiber, M. Both are smooth 4–manifolds with boundary Σ. A theorem of Fintushel and Stern expresses the signature of M in terms of the Casson invariant of Σ. Our first theorem expresses the signature of P in terms of an equivariant Casson invariant, the action being the complex conjugation on the link. These results lead to elimination of gauge theory from the definition of Floer homology of the links of quasihomogeneous singularities. The second theorem (joint with O. Collin) refines the Fintushel–Stern formula to relate equivariant signatures of M to equvariant Casson invariants, the action in this case being $(x, y, z) \mapsto (x, y, e^{2\pi i/r} z)$.