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Anisotropy in Stanley-Reisner rings

A smooth projective toric variety defined by a complete simplicial fan satisfies the classical Hard Lefschetz theorem and Hodge-Riemann bilinear relations. I will discuss the extensions of these theorems to the case of not necessarily projective simplicial fans, and more generally, to simplicial homology spheres. We construct an algebra of simplicial spheres, where the algebra operation is the connected sum of spheres. Using this algebra, one can decompose the cohomology ring of a simplicial sphere into elementary pieces and study each piece separately. We apply this to generalize the anisotropy theorem of Papadakis and Petrotou. This is a joint work with Elizabeth Xiao.