Gorenstein Invariant Subrings of Regular Algebras under Hopf Algebra Actions.

Watanabe’s Theorem states that if a finite group $G$ acts on a commutative polynomial ring $A = k[V]$ as elements of $\text{SL}_n(V)$, then the ring of invariants $A^G$ is a Gorenstein ring. We consider generalizations of this theorem in the setting where the group algebra $kG$ is replaced by a finite dimensional semi-simple Hopf algebra $H$, and $A$ is a noetherian Artin-Schelter regular algebra that is an $H$-module algebra, with each homogeneous component $A_j$ an $H$-module. Defining an extension of Jorgensen and Zhang’s notion of the homological determinant of a group action to Hopf algebra actions, we prove the following generalization of Watanabe’s Theorem:

**Theorem.** If the homological determinant of the $H$-action on $A$ is trivial, then the invariant subring $A^H$ is an Artin-Schelter Gorenstein ring.

Examples of Hopf algebra actions on regular algebras are also presented. (Received August 11, 2008)