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Section:

2. Algebra

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Cipu, Mihai, Institute of Mathematics, Bucharest, Romania
Multiplicities and pure resolutions for Gorenstein codimension four algebras

A homogeneous algebra S over a field K is isomorphic to R/I, where $R := K[x_1, x_2, \ldots, x_n]$ is a commutative polynomial ring and I is a homogeneous ideal contained in $(x_1, x_2, \ldots, x_n)R$. Such an algebra is said to have *pure resolution* if there exists a graded exact sequence of the form

$$0 \longrightarrow R(-d_c)^{\beta_c} \longrightarrow \ldots \longrightarrow R(-d_1)^{\beta_1} \longrightarrow R \longrightarrow S \longrightarrow 0 \quad ,$$

where the shifts d_i and Betti numbers β_i are positive integers. We prove that the shifts in the pure resolution of a Gorenstein codimension four homogeneous algebra are uniquely determined by the multiplicity $e(S)$. This extends a result of Huneke and Miller who used the additional hypothesis $e(S) < 10^{12}$.

Reference: C. Huneke and M. Miller, A note on the multiplicity of Cohen–Macaulay algebras with pure resolutions, *Canad. J. Math.* , **37**(1985), 1149–1162