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Yu Xie* (yxie@nd.edu), 1329 Squire Dr. Apt E, South Bend, IN 46637. *Formulas for the multiplicity of graded algebras.*

Let $A = k[A_1] \subseteq B = k[B_1]$ be a homogeneous inclusion of standard graded Noetherian domains over an infinite field k . We want to express the multiplicity of A in terms of that of B and local multiplicities along $\text{Proj}(B)$. One of the applications is to find the multiplicity of the special fibre ring of an ideal generated by forms of the same degree in a standard graded Noetherian k -algebra.

Observe that $\dim A \leq \dim B$ and they are equal if and only if their quotient fields extension is algebraic of degree r . If B is integral over A , i.e., $\dim B/A_1B = 0$, then $e(B) = re(A)$. In 2001, Simis, Ulrich and Vasconcelos gave a formula when $\dim A = \dim B$ and $\dim B/A_1B = 1$. We generalize their formula to arbitrary dimensions of B/A_1B . We also provide a formula for the case when $\dim A < \dim B$. Thus we give a complete answer to the original question.

The formulas we obtain can be used to find the degree of dual varieties for any hypersurfaces without any restrictions on its dual varieties and singularities. In particular, it gives a generalization of Teissier's Plücker formula to hypersurfaces with non-isolated singularities. (Received January 20, 2010)