1024-13-103   **Mel Hochster**, University of Michigan, Ann Arbor, MI , and **Yongwei Yao*** (`yyao@gsu.edu`), Georgia State University, Atlanta, GA 30303. *Second coefficients of Hilbert-Kunz functions for domains.* Preliminary report.

Let $(R, \mathfrak{m}, k)$ be an excellent (e.g., F-finite) local Noetherian domain of prime characteristic p with $\dim(R) = d$, I an ideal of R such that $\lambda(R/I) < \infty$ and M a finitely generated (torsion-free) R-module. We study the existence of $\beta(M) \in \mathbb{R}$ such that

$$\lambda(M/I^{[q]}M) = e_{HK}(I, M)q^d + \beta(M)q^{d-1} + O(q^{d-2}).$$

We refer to $\beta(M)$ as the second coefficient of the Hilbert-Kunz function. (The first coefficient, $e_{HK}(I, M)$, always exists and is the Hilbert-Kunz multiplicity.) In particular, we show the existence of such $\beta(M)$ when the defining ideal of the singular locus of R has height at least 2 (i.e., R satisfies the $\mathbf{R}_1$ condition). (When R is excellent and normal, the second coefficient exists by work of Huneke-McDermott-Monsky.) This is joint work with Mel Hochster. (Received January 03, 2007)