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Patricia Klein* (triciajk@umich.edu). *Asymptotic Behavior of Certain Koszul Cohomology Modules.*

Let (R, m) be a local ring, M a finitely generated module over R , and f_1, \dots, f_d a system of parameters on M . Lech's limit formula states that as $\min_i t_i \rightarrow \infty$

$$\frac{\ell(M/(f_1^{t_1}, \dots, f_d^{t_d})M)}{t_1 \cdots t_d} \longrightarrow e(f_1, \dots, f_d \mid M),$$

the multiplicity of (f_1, \dots, f_d) on M . One may ask whether powers of a fixed sequence of parameters may be replaced in this formula by any sequence of parameter ideals I_n such that $I_n \subseteq m^n$. Recalling that the multiplicity may be realized as the alternating sum of the lengths of Koszul cohomology modules and that $H^n(f_1^{t_1}, \dots, f_d^{t_d} \mid M) \cong M/(f_1^{t_1}, \dots, f_d^{t_d})M$, we may rewrite Lech's limit formula as follows

$$\frac{\sum_{j=0}^n (-1)^{n-j} \ell(H^j(f_1^{t_1}, \dots, f_d^{t_d}; M))}{\ell(H^n(f_1^{t_1}, \dots, f_d^{t_d}))} \longrightarrow 1.$$

From this point of view, it is also natural to ask in the case where $\dim M = \dim R = d$ for which $i < d$ we have $\ell(H^i(I_n; M))/\ell(R/I_n R) \rightarrow 0$. In this talk, we will consider the latter question. The main result is that when M is faithful, the M satisfying the above condition are exactly those M that are locally Cohen-Macaulay. (Received January 17, 2017)