1128-13-204 **Patricia Jacobs 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 $f_1, \ldots, f_d$ a system of parameters on M. Lech's limit formula states that as $\min_i t_i \to \infty$

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

the multiplicity of $(f_1, \ldots, f_d)$ on M. One may ask whether powers of a fixed sequence of parameters may be replaced 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 $H^n(f_1^{t_1}, \ldots, f_d^{t_d} \mid M) \cong M/(f_1^{t_1}, \ldots, f_d^{t_d})M$, we rewrite Lech's limit formula as follows

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

From this point of view, it is also natural to ask in the case when $\dim M = \dim R = d$ for which $i < d$ we have $\ell(H^i(I_n; M))/\ell(R/I_nR) \to 0$. The main result is that when M is faithful, the M satisfying the condition that $\ell(H^i(I_n; M))/\ell(R/I_nR) \to 0$ for all $i < d$ and all parameter $I_n \subseteq m^n$ are exactly those M that are locally Cohen-Macaulay. (Received February 26, 2017)