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**Patricia Klein, Linquan Ma, Pham Hung Quy, Ilya Smirnov and Yongwei Yao\***  
(yyao@gsu.edu). *Lech's inequality, the Stückrad-Vogel conjecture, and uniform behavior of Koszul homology.*

Let  $(R, \mathfrak{m})$  be a Noetherian local ring, and let  $M$  be a finitely generated  $R$ -module of dimension  $d$ . We prove that the set  $\left\{ \frac{\ell(M/IM)}{e(I, M)} \right\}_{\sqrt{I}=\mathfrak{m}}$  is bounded below by  $1/d!e(\overline{R})$  where  $\overline{R} = R/\text{Ann}(M)$ . Moreover, when  $\widehat{M}$  is equidimensional, this set is bounded above by a finite constant depending only on  $M$ . The lower bound extends a classical inequality of Lech, and the upper bound answers a question of Stückrad–Vogel in the affirmative. As an application, we obtain results on uniform behavior of the lengths of Koszul homology modules. (Received September 17, 2019)