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**Steven Dale Cutkosky\*** (cutkoskys@missouri.edu), Dept. Math., Univ. Missouri, Columbia, MO 65211. *Asymptotic Growth of Saturated Powers and Epsilon Multiplicity.*

We study the growth of saturated powers of modules. In the case of an ideal  $I$  in a local ring  $(R, \mathfrak{m})$ , the saturation of  $I^k$  in  $R$  is  $(I^k)^{\text{sat}} = \cup_{n=1}^{\infty} I^k :_R \mathfrak{m}^n$ . There are examples showing that the algebra of saturated powers of  $I$ ,  $\bigoplus_{k \geq 0} (I^k)^{\text{sat}}$  is not a finitely generated  $R$ -algebra; As such, it cannot be expected that the “Hilbert function”, giving the length of the  $R$ -module  $(I^k)^{\text{sat}}/I^k$ , is very well behaved for large  $k$ . However, it can be shown that it is bounded above by a polynomial in  $k$  of degree  $d$ , where  $d$  is the dimension of  $R$ . We show that for quite general domains, there is a reasonable asymptotic behavior of this length. We extend this to the case of modules to show that the epsilon multiplicity, defined by Ulrich, Validashti and Kleiman, exists as a limit over very general domains. (Received August 11, 2011)