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**Michel L. Lapidus** ([lapidus@math.ucr.edu](mailto:lapidus@math.ucr.edu)), 900 University Avenue, Riverside, CA 92521. *Tube formulas and complex dimensions of self-similar tilings.*

By defining a zeta function for self-similar tilings, we are able to extend some aspects of the theory of fractal strings and their complex dimensions to fractal subsets of general Euclidean spaces. In particular, we obtain a zeta function as the generating function of the geometry, and the poles of this zeta function are the complex dimensions of the self-similar tiling. The tube formula for such a tiling in  $\mathbb{R}^d$  as a power series in  $\epsilon$ .

The Steiner formula gives the volume of the  $\epsilon$ -neighbourhood of a compact convex subset  $A$  in  $\mathbb{R}^d$ , as a polynomial in  $\epsilon$  with coefficients given by the curvature measures of  $A$ , summed over  $\{0, 1, \dots, d-1\}$ . Our tube formula is a fractal extension of this, in which the sum is not only taken over the integers  $0, 1, \dots, d-1$ , but also has a term for each *complex* dimension and thus has infinitely many terms in general. This provides further justification for the term “complex dimension”. It also extends and sheds new light on the tube formula for fractals strings. (Received February 08, 2006)