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Hafedh Herichi and **Michel L. Lapidus*** (lapidus@math.ucr.edu), Department of Mathematics, 231 Surge Bdg., Riverside, CA 92521-0135. *Spectra of Fractal Strings and Riemann Zeros.*

We will provide a precise functional analytic framework for studying the spectral operator, acting on the class of generalized fractal strings of a given dimension, as introduced semi-heuristically by M. van Frankenhuysen and the presenter in their 2006 Springer research monograph "Fractal Geometry, Complex Dimensions and Zeta Functions" (Sect. 6.3.2). After having expressed the spectral operator as a function of the infinitesimal shift of the real line, we will exactly determine its spectrum, and show that for a given dimension D in the critical interval $(0,1)$, the spectral operator is invertible if and only if the Riemann zeta function does not have any zeros on the vertical line $\text{Re}(s)=D$. It follows that the Riemann hypothesis is true if and only if the spectral operator is invertible in every dimension other than the mid-fractal one, $D=1/2$. If time permits, we will also discuss related results of the authors concerning an operator-valued Euler representation of the spectral operator, as well as a localized version of the spectral operator recently obtained by the author. (Received June 26, 2011)