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Spectral decimation of the magnetic Laplacian on the Sierpinski gasket.

The magnetic Laplacian (also called the line bundle Laplacian by R. Kenyon) on a weighted graph is a self-adjoint operator wherein the real-valued adjacency weights are replaced by complex-valued weights. When properly interpreted, these complex weights give rise to magnetic fluxes through cycles in the graph. In this paper we explicitly solve the spectrum of the magnetic Laplacian on the Sierpinski gasket (SG) graphs where the magnetic fluxes equal α through the smallest upright triangles, and β through the smallest downright triangles. Our method of proof is by "spectral decimation" which allows to project the eigenspace of the magnetic Laplacian on level N to an eigenspace of a different magnetic Laplacian on level-$(N-1)$, via a 3-parameter non-rational decimation function. Our analysis takes into account the dependency on both the magnetic fluxes and the spectral parameter, thereby correcting a mistake made in the physics literature from the 80s. As a result, we demonstrate the true "Hofstadter butterfly" in this setting by computing the Julia set of iterates of the decimation function. (Received August 16, 2019)