1051-34-115   **Robert Carlson*** (`rcarlson@uccs.edu`), Department of Mathematics, University of Colorado at Colorado Springs, 1420 Austin Bluffs Parkway, Colorado Springs, CO 80933. *Two Themes of Rational Quantum Graphs.*

Suppose Δ is the Laplace operator for a finite metric graph with the standard continuity and derivative conditions at all vertices. If the edge lengths are rational multiples of a common value, then the eigenvalues have a simple explicit description based on the spectrum of a vertex Laplace operator defined on an extended finite set of vertices. This regularity can be used in several ways.

It is possible to develop asymptotic expansions for the operator characteristic function of $\Delta + q$; this leads to explicit and implicit asymptotics for the eigenvalues of $\Delta + q$. (joint work with V. Pivovarchik)

In a different direction, one can consider restricting the eigenfunctions of Δ to a set of uniformly spaced sample points along the graph edges. This leads to a graph Discrete Fourier Transform, and efficient algorithms (FFT) for its computation. These ideas may be used to analyze the trapezoidal rule for integration on the two sphere using spherical coordinates. (Received August 20, 2009)