The Dirac operator on graphs

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We determine conditions for the quantization of graphs using the Dirac operator for both two and four component spinors. The vertex transition matrix (and scattering matrix) is found to be independent of the type of spinor. We derive an exact trace formula for the spectrum. For such systems with time reversal symmetry the energy level statistics are conjectured [1], in the semi-classical limit, to correspond to those of random matrices from the Gaussian symplectic ensemble. This is confirmed by numerical investigation.

1. Bohigas, Giannoni and Schmit (1984) Phys. Rev. Lett. 52 1-4
2. Bolte and Harrison (2003) J. Phys. A: Math. Gen. 36 2747-2769
3. Bolte and Harrison (2003) J. Phys. A: Math. Gen. 36 L433-L440