1036-11-126 **P. Robert Kotiuga*** (prk@bu.edu), Boston University ECE Dept., 8 Saint Mary's Street, Boston, MA 02215. *Algebraic Number Fields, Primes, and Photonic Devices.* Preliminary report.

In creating photonic devices by putting aperiodic arrays of nanoscale metal dots on silicon chips, an objective is the synthesis of "localized electromagnetic fields" which do not exist in either lattices or quasi-crystals. In the 1-d version of this problem, symbolic dynamics identified a framework for using the Thue-Morse, Rudin-Shapiro, and Fibonacci sequences to create aperiodic structures which produce localized fields. However, these 1-d paradigms didn't prepare us for systematically designing 2-d structures.

In 2-d, Gaussian and Eisenstein primes were successful experimentally, suggested a new direction, and we formulated an inverse problem involving scale invariant structures whose Fourier spectrum is self-similar. The relationship between primes in algebraic number fields and ordinary primes explained why the primes in algebraic number fields are related to scale invariant two-dimensional structures. Gaussian and Eisenstein primes, associated zeta-functions, quadratic residues and Gaussian sums were systematically exploited along the way.

In designing these 2-d photonic devices exploiting "localized fields", the logarithm of algebraic number fields' zeta-function plays a key role. (Received January 20, 2008)