On the spectrum of the Kronig–Penney model in a constant electric field

Simon Larson

Caltech

Abstract. We are interested in the nature of the spectrum of the one-dimensional Schrödinger operator

$$-\frac{d^2}{dx^2} - Fx + \sum_{n\in\mathbb{Z}} g_n \delta(x-n)$$

with $F > 0$ and two different choices of the coupling constants $\{g_n\}_{n\in\mathbb{Z}}$. In the first model $g_n \equiv \lambda$ and we prove that if $F \in \pi^2\mathbb{Q}$ then the spectrum is $\mathbb{R}$ and is furthermore absolutely continuous away from an explicit discrete set of points. In the second model g_n are independent random variables with mean zero and variance λ^2. Under certain assumptions on the distribution of these random variables we prove that almost surely the spectrum is dense pure point if $F < \lambda^2/2$ and purely singular continuous if $F > \lambda^2/2$. Based on joint work with Rupert Frank.