Crystalline measures: quantum graphs, stable polynomials and explicit examples

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Crystalline measures are tempered distributions given by locally finite purely atomic measures whose Fourier transform is also a purely atomic measure. Such measures were studied by J.-P. Kahane, A.-P. Guinand, and S. Mandelbrojt in the fifties. It remained unclear whether Dirac combs provide the only type of examples of crystalline measures with uniformly discrete support. We are going to show how to construct a wide family of crystalline measures using quantum graphs (differential operators on metric graphs) and more generally via stable polynomials. The measure we obtain are:

- positive crystalline measures with uniformly discrete support;
- Fourier quasicrystals for which every arithmetic progression meets the support in a finite set;
- Fourier quasicrystals for which the support is a Delone set, but the support of the Fourier transform not.

Our results complement recent studies by Y. Meyer, N. Lev, A. Olevskii, and others. This is a joint work with Peter Sarnak.