A planar large sieve and sparsity of time-frequency representations

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With the aim of measuring the sparsity of a real signal, Donoho and Logan introduced the concept of maximum Nyquist density, and used it to extend Bombieri's principle of the large sieve to bandlimited functions. This led to several recovery algorithms based on the minimization of the L_1-norm. We introduce the concept of planar maximum Nyquist density, which measures the sparsity of the time-frequency distribution of a function. We obtain a planar large sieve principle which applies to time-frequency representations with a Gaussian window, or equivalently,to Fock spaces, allowing for perfect recovery of the short-Fourier transform (STFT) of functions in the modulation space M_1 corrupted by sparse noise and for approximation of missing STFT data in M_1, by L_1-minimization.

Joint work with Daniel Abreu (Acoustics Research Institute, Austrian Academy of Sciences).