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Nonvanishing minors and uncertainty principles for Fourier analysis over finite fields

Chebotarëv's theorem on roots of unity says that every minor of a discrete Fourier transform matrix of prime order is nonzero. We present a generalization of this result that includes analogues for discrete cosine and discrete sine transform matrices as special cases. This leads to a generalization of the Biró-Meshulam-Tao uncertainty principle to functions with symmetries that arise from certain group actions, with some of the simplest examples being even and odd functions. This new uncertainty principle gives a bound that is sharp and, for some classes of functions, stronger than that of Biró-Meshulam-Tao.