

# A new proof of the Hansen-Mullen irreducibility conjecture

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We present a new proof of the Hansen-Mullen irreducibility conjecture. The proof relies on an application of a (seemingly new) sufficient condition for the existence of elements of degree  $n$  in the support of functions on finite fields. This connection to irreducible polynomials is made via the least period of the discrete Fourier transform (DFT) of functions with values in finite fields. We exploit this relation and prove, in an elementary fashion, that a relevant function related to the DFT of characteristic elementary symmetric functions (which produce the coefficients of characteristic polynomials) has a sufficiently large least period (except for some genuine exceptions). This bears a sharp contrast to previous techniques in literature employed to tackle existence of irreducible polynomials with prescribed coefficients.

*This is a joint work with Qiang Wang*