



## IPM Math Colloquium

### سخنرانی عمومی

# Low-Density Parity-Check Codes Based on Steiner Systems and Difference Sets

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### چکیده

Construction of structured regular quasi-cyclic (QC) low-density parity-check (LDPC) codes based on Steiner systems and difference sets is considered.

Steiner systems with  $t \geq 3$  are used to generate girth-6 LDPC codes. Given a Steiner system  $(X, \mathcal{B})$ , this system and its residual design with respect to an arbitrary point  $x \in X$  are employed for code construction. Also, difference sets are used to give a method for constructing structured regular quasi-cyclic LDPC codes. Let  $F_q$  be a field with  $q$  elements and assume that  $D = \{d_1, \dots, d_k\}$  is a  $(v, k, 1)$ -difference set for  $Z_v$  with  $d_1 < d_2 < \dots < d_k$ . Depending on  $v = q - 1$ ,  $v \geq 2d_k$  or  $v \geq 2d_{k-1}$ , three code construction methods are given that produce regular 4-cycle free codes.

Simulation results show that the constructed codes perform well over the AWGN channel with iterative sum-product message-passing decoding algorithm.

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