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## On a generalization of the circulant Hadamard conjecture

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**Abstract:** A Hadamard matrix is a square matrix with entries 1 and -1 such that its columns are mutually orthogonal. The circulant Hadamard conjecture states that circulant Hadamard matrices exist only of orders  $n=1$  and  $n=4$ . The conjecture, which dates back to a book of Ryser (1963), was partially proved in the symmetric case (Johnsen 1964); the general case, however, remains open to this day.

In the talk, we consider an extension of circulant Hadamard matrices by introducing a parameter  $d$  on the diagonal, while keeping the orthogonality condition. Analyzing the existence of such matrices, we generalize the theorem of Johnsen (1964) and at the same time a theorem of Stanton and Mullin (1976) on circulant conference matrices. On the basis of our findings, we conjecture that the order of the circulant matrices with a parameter  $d$  on the diagonal must be  $n=2d+2$  for any odd integer  $d$ .

The talk is based on a joint work with D. Goyeneche.