Meeting: 1005, Newark, Delaware, SS 5A, Special Session on Designs, Codes, and Geometries

1005-05-29 **M. E. Muzychuk*** (muzy@netanya.ac.il), Dept. of Comp. Science, Netanya Academic College, 42365, Netanya, Israel, and **Qing Xiang**, Department of Mathematical Sciences, University of Delaware, Newark, DE DE 19716,. *Symmetric Bush-type Hadamard matrices of order $4m^4$ exist for all odd m.*

An Hadamard matrix of order $4n^2$ is called of *Bush-type* if it can be partitioned into square submatrix H_{ij} of order $2n$ such that

$$H_{ii} = J_{2n}, \text{ and } H_{ij}J_{2n} = J_{2n}H_{ij} = 0,$$

for $i \neq j$, $1 \leq i, j \leq 2n$, where J_{2n} is all-one matrix.

While it is relatively easy to construct Bush-type Hadamard matrices of order $4n^2$ for all even n for which a Hadamard matrix of order $2n$ exists, it is not easy to decide whether such matrices of order $4n^2$ exist if $n > 1$ is an odd integer. In a recent survey, Jungnickel and Kharaghani wrote "Bush-type Hadamard matrices of order $4n^2$, where n is odd, seem pretty hard to construct. Examples are known for $n = 3$, $n = 5$, and $n = 9$; all other cases are open".

In this talk, we will show that reversible Hadamard difference sets constructed by Wilson and Xiang give rise to symmetric Bush-type Hadamard matrices of order $4m^4$ for all odd m. (Received January 13, 2005)