1046-05-495 **Carlos Harold Salazar-Lazaro*** (SalazarLazC@gmail.com), 30 North 11th St. Apt 2, San Jose, CA 95112. *Progress on the Skew Hadamard Difference Set existence problem.*

It has been conjectured that the only abelian groups G that admit difference sets D with the skew condition $D + D^{(-1)} = G - [0]$ are the elementary p-abelian groups with an odd number of invariant factors and with $|G| = 3 \bmod 4$. The best progress on this conjecture is in the form of exponent bounds. In the following, we will formulate the existence problem for Generalized Skew Hadamard Difference Sets and extend this conjecture to the case $|G| = 1 \bmod 4$. We will introduce a combinatorial incidence matrix A_{G,G_1} that depends on the structure of G, use this matrix to reformulate the existence conjecture, show the fundamental algebraic equation $A^2_{G,G_1} = \frac{|G|}{p} I$, prove the known exponent bounds using A_{G,G_1} in the language of GSHDSs, and give some existence conditions for the family of groups $G = (Z/pZ) \times (Z/p^2Z)^{2\beta+1}$. (Received September 05, 2008)