

1167-15-246

**Hang Huang\*** (huanghang1109@gmail.com), **J M Landsberg** and **Austin Conner**. *Border Apolarity and Border Rank of the  $3 \times 3$  Permanent*.

The exponent  $\omega$  of matrix multiplication is a fundamental constant governing the complexity of the basic operations in linear algebra. The upper bounds on  $\omega$  of 2.38 and below have been obtained using Strassen's laser method via auxiliary tensors called Coppersmith-Winograd tensors. It has been a long-standing problem to determine the border rank of the Kronecker square of the only Coppersmith-Winograd tensor that could potentially be used to prove  $\omega = 2$  (the  $q = 2$  small Coppersmith-Winograd tensor). We will discuss how we solve the problem with the recently developed technique called border apolarity and a refined condition we used called flag condition. (Received March 08, 2021)