Measurement of the Total Cross Section of Uranium-Uranium Collisions at $\sqrt{s_{NN}} = 192.8$ GeV

A.J. BALTZ, W. FISCHER, M. BLASKIEWICZ, D. GASSNER, K.A. DREES, Y. LUO, M. MINTY, P. THIEBERGER, M. WILINSKI, Brookhaven National Laboratory, I.A. PSHENICHNOV, Institute for Nuclear Research, Moscow — The total cross section of Uranium-Uranium at $\sqrt{s_{NN}} = 192.8$ GeV has been measured to be $515 \pm 13^{\text{stat}} \pm 22^{\text{sys}}$ barn, which agrees with the calculated theoretical value of 487.3 barn within experimental error[1]. That this total cross section is more than an order of magnitude larger than the geometric ion-ion cross section is primarily due to Bound-Free Pair Production (BFPP) and Electro-Magnetic Dissociation (EMD). Nearly all beam losses were due to geometric, BFPP and EMD collisions. This allowed the determination of the total cross section from the measured beam loss rates and luminosity. The beam loss rate is calculated from a time-dependent measurement of the total beam intensity. The luminosity is measured via the detection of neutron pairs in time-coincidence in the Zero Degree Calorimeters. Apart from a general interest in verifying the calculations experimentally, an accurate prediction of the losses created in the heavy ion collisions is of practical interest for the LHC, where collision products have the potential to quench cryogenically cooled magnets.


Anthony Baltz
Brookhaven National Laboratory

Date submitted: 07 Jan 2014