January 21, 2004
D0 Note 4328

The Updated DØ Luminosity Determination

The DØ instantaneous luminosity calculation has been updated. CDF and DØ now use the same estimate for the inelastic cross section and halo dependent effects are now corrected tick by tick. The estimated error on the DØ luminosity has decreases from 10% to 6.5%.

The following have changed:

- The inelastic cross section is now 60.7 $\pm$ 2.4 mb. This value is the result of a reanalysis of the world's data performed by Klimenko *et al.* (Fermilab FN-741). The value used by D0 in Run I was 57.6 $\pm$ 1.6 mb (Fermilab TM-1930). We now assume an inelastic cross section at 1800 GeV of 59.3 ± 2.3 mb from the new Klimenko analysis and a $2.3 \pm 1\%$ rise due to the increased center of mass energy. The use of the new cross section lowers the estimated luminosity.

- The estimate of the efficiency and acceptance of the detector has been improved. The central value for the product of efficiency and acceptance has shifted from a preliminary Run II estimate of $75.1 \pm 7\%$ to $75.8 \pm 3.8\%$.

- Corrections for deadtime due to concurrent proton and anti-proton halo are now applied tick by tick. This correction ranges from 1% to 6% with higher corrections at higher beam current. This correction raises the estimated luminosity.

The updated instantaneous luminosity calculation went online at 2PM on January 19th, 2004 and will be used for future reports. Revised integrated luminosities for all of Run II will be available by the end of January.

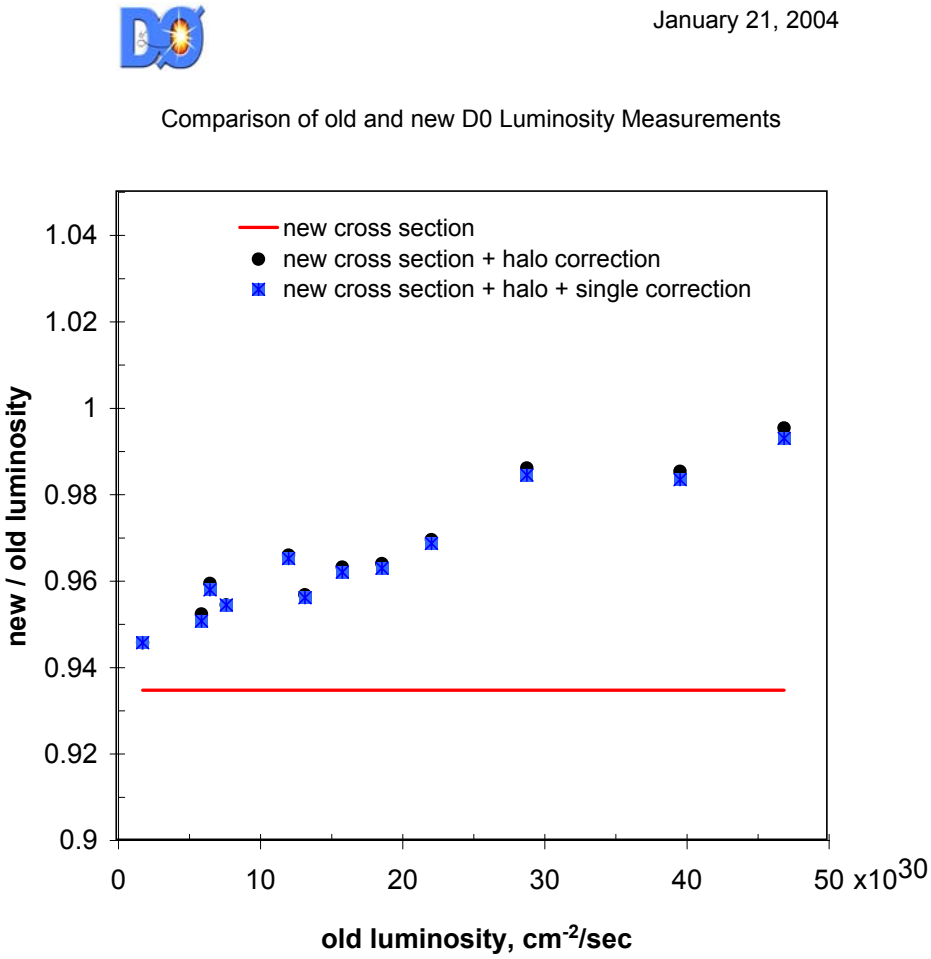

Figure 1: Fractional change in luminosity vs luminosity for a few typical measurements. The straight line shows the effect of changing the cross section, efficiency and acceptance alone. The points show the effect of making that change and in addition, correcting for halo deadtime and overlapping single diffractive events.