Erratum
Cross sections for the production of high-mass muon pairs from 800 GeV proton bombardment of ^{2}H

P.L. McGaughey, J.M. Moss, J.-C. Peng, D.M. Alde, H.W. Baer, T.A. Carey, G.T. Garvey, A. Klein, C. Lee, M.J. Leitch, J. Lillberg, and C.S. Mishra
Los Alamos National Laboratory, Los Alamos, New Mexico 87545

C.N. Brown, W.E. Cooper, and Y.B. Hsiung
Fermilab, Batavia, Illinois 60510

M.R. Adams
University of Illinois at Chicago, Chicago, Illinois 60680

R. Guo and D.M. Kaplan
Northern Illinois University, DeKalb, Illinois 60115

R.L. McCarthy
SUNY at Stony Brook, Stony Brook, New York 11794-3800

G. Danner and M. Wang
Case Western Reserve University, Cleveland, Ohio 44106

M. Barlett and G. Hoffmann
University of Texas, Austin, Texas 78712

Absolute cross sections as function of kinematic variables are presented in corrected form for the production of muon pairs from 800 GeV proton bombardment of ^{2}H.
PACS numbers: 13.85.Qk, 12.38.Qk, 25.40.Ve

We present corrected cross sections for dimuon production from 800 GeV proton bombardment of ^{2}H from Fermilab experiment 772 (E772) [1]. Table I lists the scaling form of the cross section for the Drell-Yan (DY) process [2],

$$M^3 \frac{d^2\sigma}{dMdx_F} = \frac{8\pi\alpha^2}{9} \frac{x_1 x_2}{x_1 + x_2} \times \sum_i e_i^2 [q_i(x_1)\bar{q}_i(x_2) + \bar{q}_i(x_1 q_i(x_2)], \tag{1}$$

where α is the fine-structure constant, e_i the electric charge of a quark or antiquark of flavor i, and $q_i(\bar{q}_i)$ are the quark (antiquark) structure functions. The kinematics of the DY process also lead to the relations,

$$\begin{aligned} M^2/s &= x_1 x_2, \\ x_F &= x_1 - x_2. \end{aligned} \tag{2}$$

These values differ from those of Ref. [1] significantly only for large values of x_F and small values of mass (M). The cross sections reported in Ref. [1] were too large in this region, due to an error in the Monte-Carlo calculation of the acceptance. This was discovered in analyzing the DY angular distribution data from E772 [3]. New acceptance calculations have been performed, decreasing cross sections in this region by a factor of up to two. The DY events in this region are on the falling edge of the spectrometer's acceptance.

Further Monte-Carlo studies show that the systematic error of the cross sections, due to uncertainties in the magnetic field maps and hodoscope alignment, is larger than the $\sim$ 10% quoted in Ref. [1] for the lowest mass dimuons. We now quote a total systematic normalization error of $\sim$ 10% for all of the cross sections plus an additional $\sim$ 10% point-to-point systematic error for the mass region below 6 GeV.

In the original publication [1], the table for the invariant form of the DY cross section (Table II) contained a numerical mistake, as well as a mislabelling (nb/GeV^2/nucleon rather than pb/GeV^2/nucleon). This resulted in cross sections that were too small by a p_t dependent factor ranging from $\approx$ 3 to $\approx$ 5. Table II gives the correct p_t dependence in terms of

$$E\frac{d^3\sigma}{dp^3} = \frac{2E}{\pi\sqrt{s}}\frac{d^2\sigma}{dp_t^2 dx_F}. \tag{3}$$

Finally, we note that the corrections presented here do not affect the nuclear dependence ratios presented in earlier publications [4].

TABLE I. Scaling form of the Drell-Yan cross section, $m^3 d^2\sigma/dmdx_F$ in nb$\times$GeV^2/nucleon. Only statistical errors are listed. See text for discussion of systematic errors.

Mass(GeV)	x_F = 0.025	Error	x_F = 0.075	Error
4.75	.214E+02	.173E+01	.213E+02	.109E+01
5.25	.192E+02	.143E+01	.172E+02	.913E+00
5.75	.170E+02	.134E+01	.135E+02	.653E+00
6.25	.939E+01	.647E+00	.108E+02	.511E+00
6.75	.751E+01	.551E+00	.874E+01	.452E+00
7.25	.572E+01	.477E+00	.822E+01	.474E+00
7.75	.689E+01	.590E+00	.496E+01	.314E+00
8.25	.355E+01	.350E+00	.414E+01	.296E+00
8.75	.340E+01	.330E+00	.363E+01	.281E+00
11.25	.167E+01	.419E+00	.126E+01	.301E+00
11.75	.928E+00	.325E+00	.706E+00	.193E+00
12.25	.600E+00	.266E+00	.286E+00	.126E+00
12.75	.308E+00	.231E+00	.897E+00	.387E+00
13.25	.463E+00	.293E+00	.543E+00	.273E+00
Mass(GeV)	x_F = 0.125	Error	x_F = 0.175	Error
4.75	.183E+02	.839E+00	.172E+02	.795E+00
5.25	.162E+02	.632E+00	.146E+02	.469E+00
5.75	.124E+02	.460E+00	.115E+02	.368E+00
6.25	.106E+02	.403E+00	.987E+01	.340E+00
6.75	.848E+01	.368E+00	.781E+01	.298E+00
7.25	.731E+01	.341E+00	.706E+01	.303E+00
7.75	.601E+01	.323E+00	.498E+01	.246E+00
8.25	.479E+01	.288E+00	.433E+01	.238E+00
8.75	.404E+01	.278E+00	.402E+01	.253E+00
11.25	.144E+01	.238E+00	.720E+00	.163E+00
11.75	.840E+00	.216E+00	.386E+00	.101E+00
12.25	.527E+00	.176E+00	.454E+00	.120E+00
12.75	.406E+00	.153E+00	.597E+00	.183E+00
13.25	.381E+00	.189E+00	.996E-01	.609E-01
13.75	.225E+00	.174E+00	.779E-01	.494E-01
14.25	.394E+00	.306E+00	.147E+00	.109E+00
14.75	.173E+00	.132E+00	.283E+00	.161E+00
Mass(GeV)	x_F = 0.225	Error	x_F = 0.275	Error
4.75	.141E+02	.795E+00	.123E+02	.862E+00
5.25	.134E+02	.401E+00	.114E+02	.363E+00
5.75	.108E+02	.334E+00	.992E+01	.330E+00

6.25	.837E+01	.284E+00	.722E+01	.258E+00
6.75	.663E+01	.254E+00	.567E+01	.219E+00
7.25	.659E+01	.279E+00	.500E+01	.218E+00
7.75	.501E+01	.233E+00	.423E+01	.212E+00
8.25	.412E+01	.219E+00	.375E+01	.204E+00
8.75	.375E+01	.226E+00	.318E+01	.200E+00
11.25	.116E+01	.190E+00	.102E+01	.150E+00
11.75	.745E+00	.153E+00	.744E+00	.139E+00
12.25	.360E+00	.956E-01	.322E+00	.814E-01
12.75	.461E+00	.151E+00	.568E+00	.181E+00
13.25	.530E+00	.199E+00	.331E+00	.141E+00
13.75	.217E+00	.973E-01	.104E+00	.768E-01
14.25	.120E+00	.946E-01	.169E+00	.102E+00
14.75	.204E+00	.133E+00	.000E+00	.000E+00

Mass(GeV)	$x_F = 0.325$	Error	$x_F = 0.375$	Error
4.75	.874E+01	.787E+00	.762E+01	.990E+00
5.25	.112E+02	.419E+00	.854E+01	.402E+00
5.75	.816E+01	.310E+00	.644E+01	.288E+00
6.25	.680E+01	.271E+00	.562E+01	.260E+00
6.75	.568E+01	.250E+00	.425E+01	.215E+00
7.25	.482E+01	.231E+00	.350E+01	.196E+00
7.75	.415E+01	.217E+00	.349E+01	.203E+00
8.25	.303E+01	.182E+00	.235E+01	.151E+00
8.75	.278E+01	.189E+00	.207E+01	.151E+00
11.25	.613E+00	.111E+00	.592E+00	.107E+00
11.75	.598E+00	.106E+00	.360E+00	.763E-01
12.25	.381E+00	.872E-01	.260E+00	.671E-01
12.75	.319E+00	.843E-01	.330E+00	.913E-01
13.25	.153E+00	.580E-01	.254E+00	.979E-01
13.75	.612E-01	.416E-01	.234E+00	.108E+00
14.25	.718E+00	.379E+00	.000E+00	.000E+00

Mass(GeV)	$x_F = 0.425$	Error	$x_F = 0.475$	Error
4.75	.782E+01	.142E+01	.471E+01	.148E+01
5.25	.720E+01	.436E+00	.596E+01	.527E+00
5.75	.579E+01	.322E+00	.504E+01	.364E+00
6.25	.477E+01	.268E+00	.330E+01	.223E+00
6.75	.373E+01	.215E+00	.276E+01	.207E+00
7.25	.263E+01	.169E+00	.215E+01	.159E+00
7.75	.229E+01	.156E+00	.170E+01	.136E+00
8.25	.237E+01	.178E+00	.148E+01	.136E+00
8.75	.207E+01	.167E+00	.139E+01	.140E+00
11.25	.351E+00	.662E-01	.267E+00	.563E-01
11.75	.361E+00	.936E-01	.406E+00	.100E+00
12.25	.278E+00	.706E-01	.188E+00	.562E-01
12.75	.298E+00	.895E-01	.204E+00	.721E-01
13.25	.207E+00	.962E-01	.117E+00	.686E-01
13.75	.720E-01	.402E-01	.857E-01	.469E-01
14.25	.133E+00	.835E-01	.000E+00	.000E+00
14.75	.298E+00	.255E+00	.725E-01	.624E-01
15.75	.113E+00	.875E-01	.000E+00	.000E+00

Mass(GeV)	$x_F = 0.525$	Error	$x_F = 0.575$	Error
5.25	.440E+01	.495E+00	.268E+01	.604E+00
5.75	.380E+01	.350E+00	.319E+01	.426E+00
6.25	.217E+01	.186E+00	.164E+01	.167E+00
6.75	.201E+01	.167E+00	.160E+01	.196E+00
7.25	.175E+01	.163E+00	.108E+01	.127E+00
7.75	.116E+01	.119E+00	.883E+00	.109E+00

8.25	.853E+00	.987E-01	.662E+00	.854E-01
8.75	.927E+00	.112E+00	.495E+00	.795E-01
11.25	.291E+00	.743E-01	.399E-01	.231E-01
11.75	.367E+00	.106E+00	.542E-01	.335E-01
12.25	.145E+00	.725E-01	.853E-01	.393E-01
12.75	.804E-01	.508E-01	.448E-01	.314E-01
13.25	.709E-01	.362E-01	.805E-01	.643E-01
13.75	.802E-01	.511E-01	.618E-01	.385E-01
14.25	.643E-01	.471E-01	.000E+00	.000E+00
14.75	.173E+00	.128E+00	.000E+00	.000E+00
Mass(GeV)	$x_F = 0.625$	Error	$x_F = 0.675$	Error
5.25	.117E+01	.387E+00	.737E+00	.413E+00
5.75	.223E+01	.417E+00	.253E+00	.126E+00
6.25	.926E+00	.141E+00	.920E+00	.246E+00
6.75	.800E+00	.114E+00	.362E+00	.872E-01
7.25	.695E+00	.124E+00	.607E+00	.148E+00
7.75	.560E+00	.992E-01	.186E+00	.442E-01
8.25	.342E+00	.703E-01	.267E+00	.769E-01
8.75	.304E+00	.823E-01	.952E-01	.444E-01
11.25	.575E-01	.310E-01	.600E-01	.383E-01
11.75	.675E-01	.408E-01	.000E+00	.000E+00
12.25	.225E+00	.156E+00	.333E-01	.302E-01
13.25	.716E-01	.529E-01	.000E+00	.000E+00

TABLE II. Invariant cross section in pb/GeV^2/nucleon for 1 GeV wide mass bins. Cross sections correspond to the range $0.1 \leq x_F \leq 0.3$. Only statistical errors are listed. See text for discussion of systematic errors.

p_t(GeV)	Mass = 5.5 GeV	Error	Mass = 6.5 GeV	Error
.125	.675E+01	.305E+00	.287E+01	.153E+00
.375	.559E+01	.156E+00	.228E+01	.765E-01
.625	.484E+01	.122E+00	.208E+01	.625E-01
.875	.350E+01	.903E-01	.135E+01	.413E-01
1.125	.256E+01	.768E-01	.105E+01	.356E-01
1.375	.178E+01	.672E-01	.669E+00	.275E-01
1.625	.112E+01	.535E-01	.397E+00	.203E-01
1.875	.817E+00	.627E-01	.262E+00	.172E-01
2.125	.259E+00	.298E-01	.213E+00	.202E-01
2.375	.346E+00	.575E-01	.117E+00	.150E-01
2.625	.147E+00	.345E-01	.979E-01	.215E-01
2.875	.457E-01	.154E-01	.376E-01	.908E-02
3.125	.000E+00	.000E+00	.229E-01	.789E-02
3.375	.000E+00	.000E+00	.345E-01	.425E-01
3.625	.000E+00	.000E+00	.106E-01	.886E-02
3.875	.000E+00	.000E+00	.501E-03	.432E-03
p_t(GeV)	Mass = 7.5 GeV	Error	Mass = 8.5 GeV	Error
.125	.168E+01	.120E+00	.755E+00	.752E-01
.375	.116E+01	.510E-01	.639E+00	.367E-01
.625	.970E+00	.362E-01	.453E+00	.229E-01
.875	.730E+00	.278E-01	.387E+00	.192E-01
1.125	.534E+00	.224E-01	.239E+00	.131E-01
1.375	.357E+00	.177E-01	.172E+00	.105E-01
1.625	.222E+00	.140E-01	.120E+00	.867E-02
1.875	.130E+00	.997E-02	.743E-01	.701E-02
2.125	.839E-01	.893E-02	.434E-01	.555E-02
2.375	.494E-01	.709E-02	.199E-01	.343E-02
2.625	.340E-01	.679E-02	.102E-01	.249E-02
2.875	.295E-01	.950E-02	.700E-02	.249E-02
3.125	.844E-02	.317E-02	.323E-02	.248E-02
3.375	.573E-02	.376E-02	.666E-02	.597E-02
p_t(GeV)	Mass = 11.5 GeV	Error	Mass = 12.5 GeV	Error
.125	.868E-01	.294E-01	.292E-01	.215E-01
.375	.916E-01	.169E-01	.184E-01	.683E-02
.625	.378E-01	.769E-02	.291E-01	.777E-02
.875	.373E-01	.644E-02	.272E-01	.603E-02
1.125	.359E-01	.541E-02	.209E-01	.456E-02
1.375	.155E-01	.342E-02	.726E-02	.208E-02
1.625	.111E-01	.250E-02	.700E-02	.255E-02
1.875	.945E-02	.246E-02	.187E-02	.880E-03
2.125	.506E-02	.158E-02	.209E-02	.147E-02
2.375	.172E-02	.821E-03	.181E-02	.127E-02
2.625	.145E-02	.876E-03	.259E-02	.205E-02
p_t(GeV)	Mass = 13.5 GeV	Error	Mass = 14.5 GeV	Error
.125	.228E-01	.178E-01	.153E-01	.207E-01
.375	.669E-02	.368E-02	.793E-02	.509E-02
.625	.449E-02	.235E-02	.000E+00	.000E+00
.875	.991E-02	.434E-02	.756E-02	.388E-02
1.125	.656E-02	.335E-02	.292E-02	.172E-02
1.375	.540E-02	.228E-02	.698E-02	.710E-02
1.625	.931E-03	.623E-03	.273E-02	.183E-02

Acknowledgement. We thank Ed Berger of Argonne National Laboratory for pointing out the mistake in the invariant form of the differential cross section in our original publication.

---

[1] P.L. McGaughey et al., Phys. Rev. D **50**, 3038(1994).
[2] S.D. Drell and T.-M. Yan, Phys. Rev. Lett. **25**, 316(1970).
[3] P.L. McGaughey, Nucl. Phys. **A610**, 394c(1996).
[4] D.M. Alde et al., Phys. Rev. Lett. **64**, 2479(1990); **66** 133(1991); **66** 2285(1991).