e1-6 Electron Momentum Correction

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Abstract

This document describes the electron momentum corrections

Contents

1 Electron Kinematic Correction

1.1 Introduction

The reconstructed momentum of the electron is slightly incorrect, due to drift chamber misalignments and an inaccurate magnetic field map This is reflected on quantities like W or missing masses, and directly affect this analysis cuts and acceptance calculations.

Here we apply the same momentum correction extrapolated in [1]. The resulting elastic peak W, the $eP(\pi^0)$ and $eP(\eta)$ missing masses are improved as shown in the following sample of plots.

1.2 Correction effects on the elastic peak

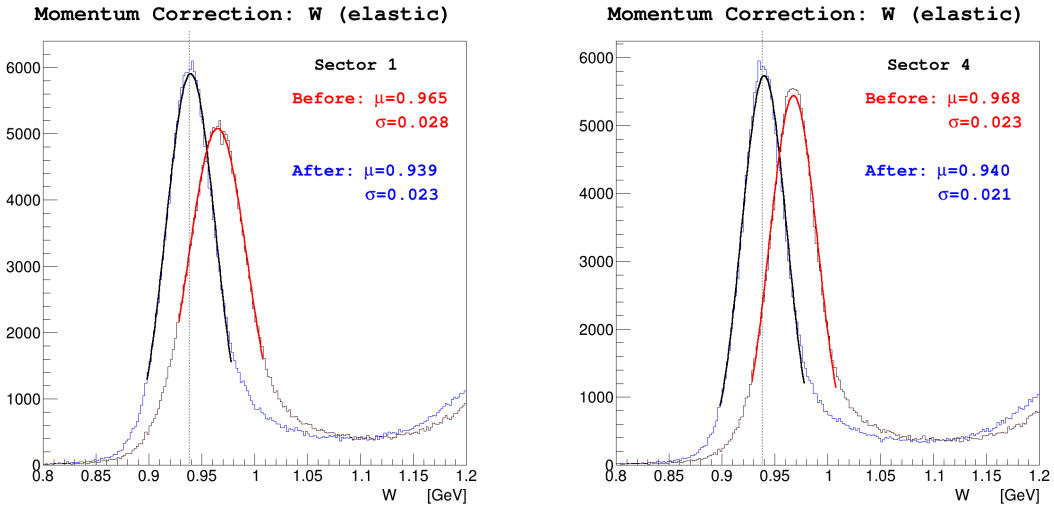

Figure 1: The W distribution before and after the correction for sector 1 (left) and sector 4 (right). The width and the position of the elastic peak are improved in all sectors.

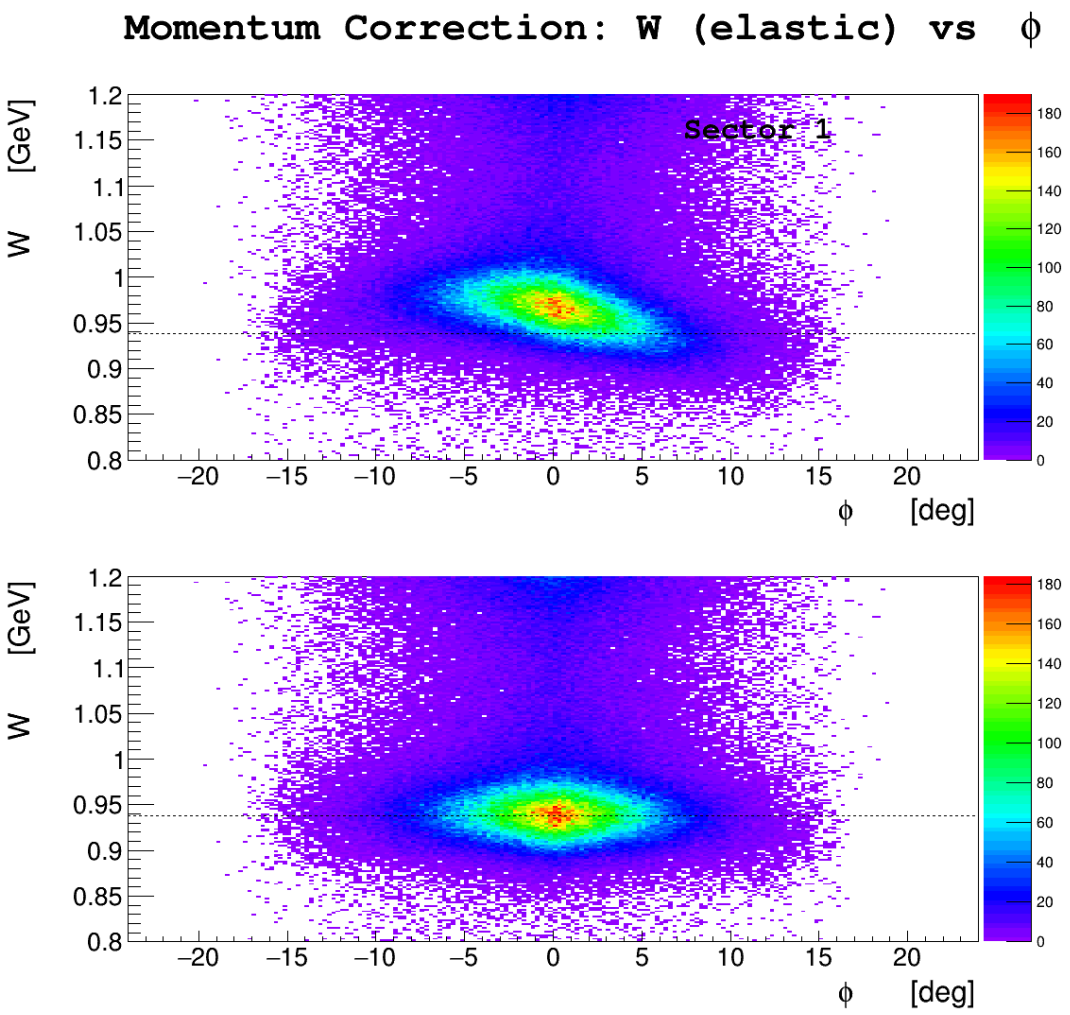

Figure 2: The W distribution as a function of ϕ before (top) and after (bottom) the correction for sector 1. The distribution is flat after the correction.

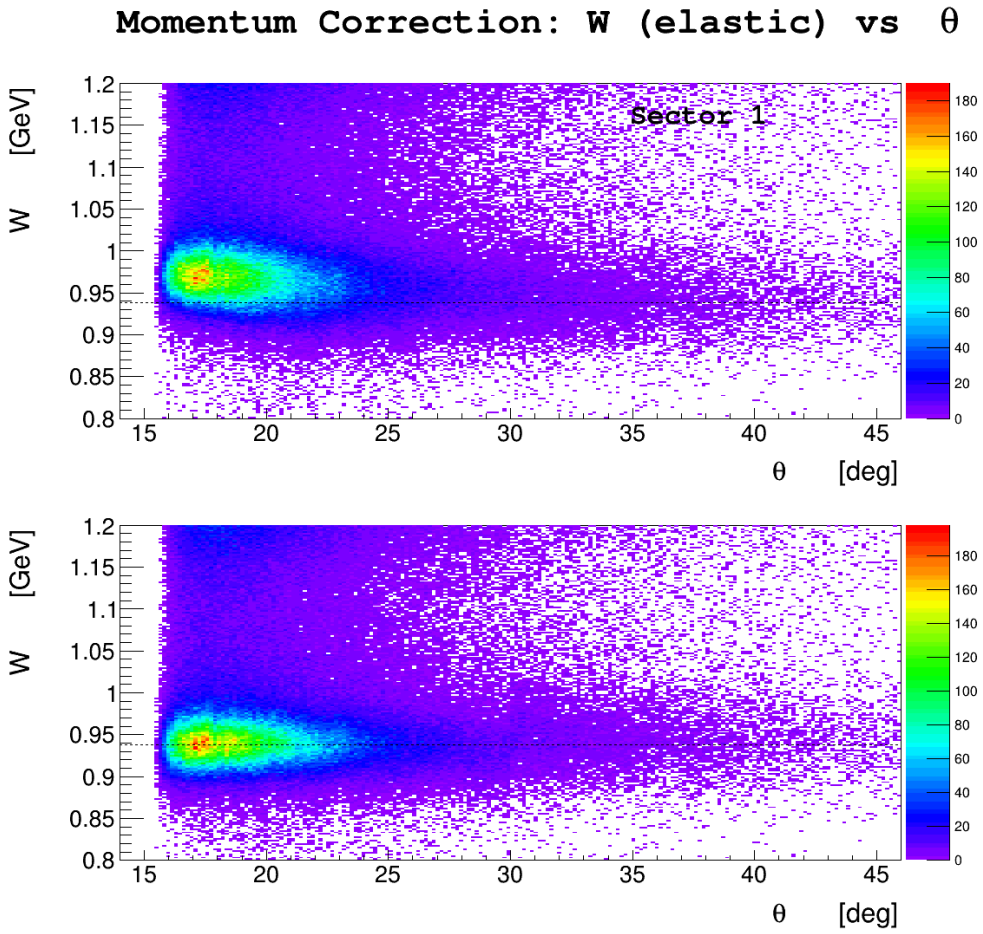

Figure 3: The W distribution as a function of θ before (top) and after (bottom) the correction for sector 1. The distribution is flat after the correction.

1.3 Correction effects on the $eP(\pi^0)$ missing mass

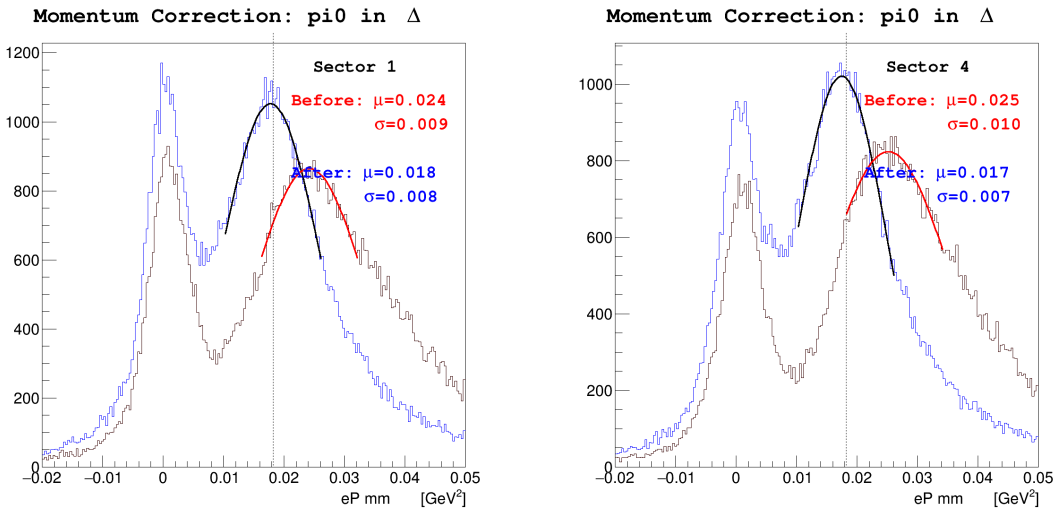

Figure 4: The $eP(\pi^0)$ mm^2 distribution before and after the correction for sector 1 (left) and sector 4 (right). The width and the position of the π^0 peak are improved in all sectors.

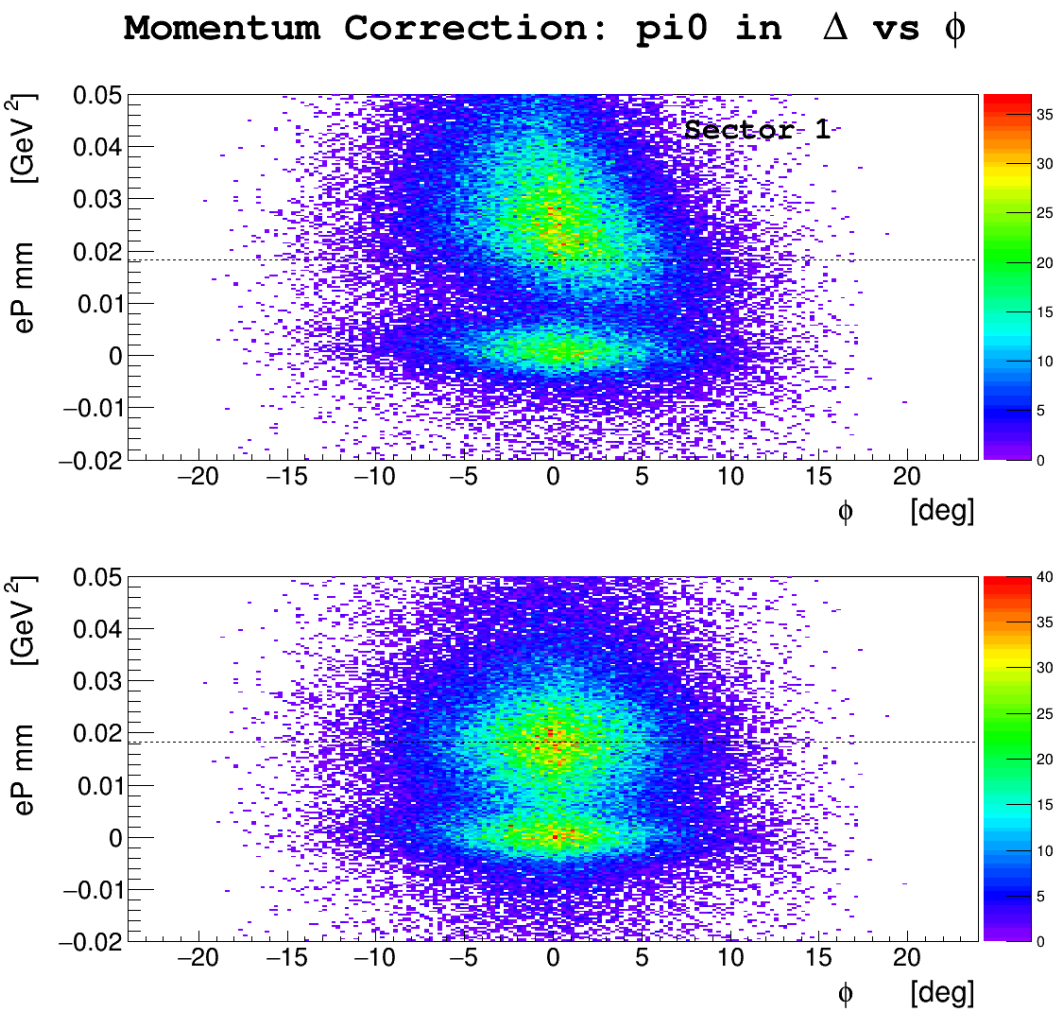

Figure 5: The $eP(\pi^0)$ mm^2 distribution as a function of ϕ before (top) and after (bottom) the correction for sector 1. The distribution is flat after the correction.

1.4 Correction effects on the $eP(\eta)$ missing mass

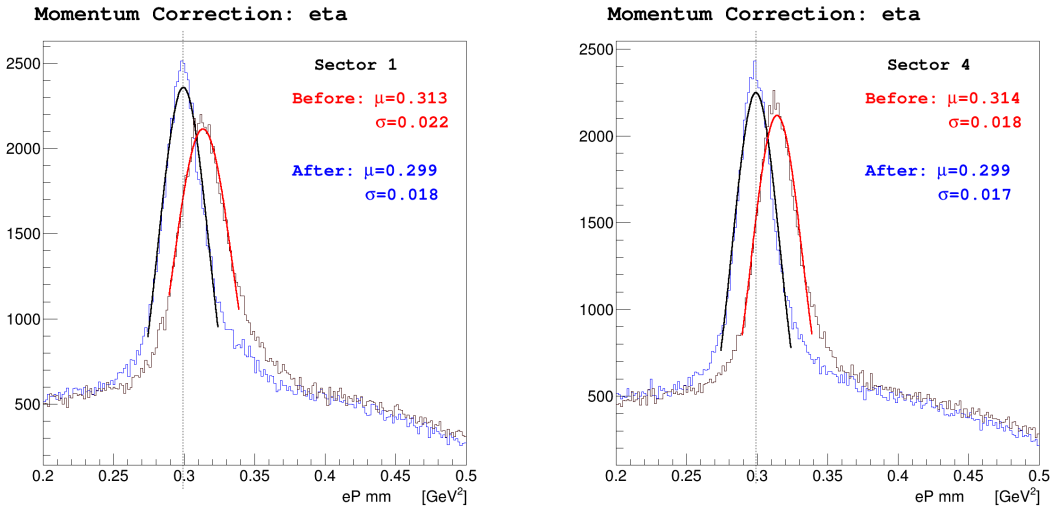

Figure 6: The $eP(\eta)$ mm^2 distribution before and after the correction for sector 1 (left) and sector 4 (right). The width and the position of the η peak are improved in all sectors.

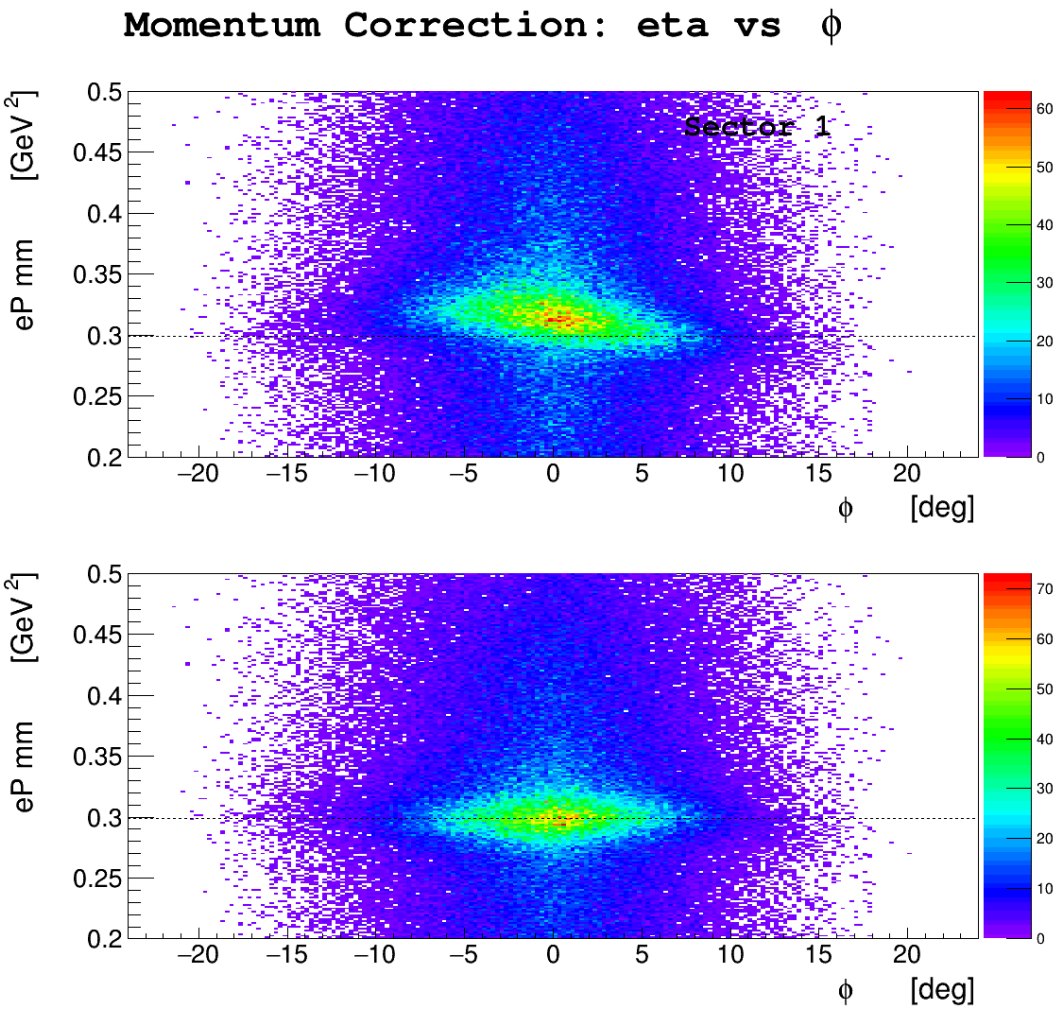

Figure 7: The $eP(\eta)$ mm^2 distribution as a function of ϕ before (top) and after (bottom) the correction for sector 1. The distribution is flat after the correction.

The complete set of plots is available at [2]. The full set of parameters and the function used in the correction is available in appendix .1.

References

[1] M.Ungaro, *Single π^0 elctroproduction from $\Delta(1232)$ at high momentum transferred with CLAS*

[2] M.Ungaro, *Electron Momentum Corrections for single π^0 elctroproduction in the first and second resonance regions*

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.1 Momentum Correction Parameters and function

Below are the parameters used to correct the electron momentum.

```
Sector 1:

a:    4.68752 -1.85247 0.309905 -0.0287839 0.00164415
      -6.01897e-05 1.41784e-06 -2.07918e-08 1.72727e-10 -6.20909e-13
b:   -0.141375 0.0658297 -0.0124197 0.00125396 -7.61444e-05
      2.9224e-06 -7.15019e-08 1.08187e-09 -9.22762e-12 3.39275e-14
c:    0.325959 -0.104809 0.0146168 -0.00116222 5.81367e-05
      -1.89952e-06 4.05847e-08 -5.47376e-10 4.23328e-12 -1.43176e-14
d:   -0.011592 0.00376657 -0.000525382 4.14727e-05 -2.04875e-06
      6.58696e-08 -1.38172e-09 1.82743e-11 -1.38541e-13 4.59477e-16
```

The function used to correct the electron momentum is:

```
V4 mom_corr::m_corr(V4 x) {
if (x.theta() / degree < 14 || x.theta() / degree > 30) return x;

V4 y;
double corr;
double a, b, c, d;
double theta = x.theta() / degree;
double phi = loc_phi(x) / degree;
int s = sector(x) - 1;

a = b = c = d = 0;

for (int p = 0; p < 10; p++) a = a + par_par_phi[s][0][p] * pow(theta, p);
for (int p = 0; p < 10; p++) b = b + par_par_phi[s][1][p] * pow(theta, p);
for (int p = 0; p < 10; p++) c = c + par_par_phi[s][2][p] * pow(theta, p);
for (int p = 0; p < 10; p++) d = d + par_par_phi[s][3][p] * pow(theta, p);

corr = (a + b * phi + c * phi * phi + d * phi * phi * phi) * GeV;

y.x = (x.mod() + corr) * sin(x.theta()) * cos(x.phi());
y.y = (x.mod() + corr) * sin(x.theta()) * sin(x.phi());
y.z = (x.mod() + corr) * cos(x.theta());
y.t = sqrt(y.mod() * y.mod() + electron_mass * electron_mass);

return y;
}
```