One-loop corrections to the Drell–Yan process in SANC: the charged current case

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Sect. 4 contains an incorrect and misleading consideration of a double-differential cross section. Moreover, the formulae given there do not correspond to the ones used in our computer codes. The section should read as follows.

The differential cross section of the Drell–Yan process can be obtained from the convolution of the partonic cross section with the quark density functions:

$$\frac{d\sigma_{\text{RC}}^{pp \rightarrow \mu^+ \nu X}(s, c)}{dc} = \sum_{q_1 q_2} \int_0^1 \int_0^1 dx_1 dx_2 \bar{q}_1(x_1, M^2) \times \bar{q}_2(x_2, M^2) \frac{d\hat{\sigma}^{q_1 q_2 \rightarrow \mu^+ \nu}(\hat{s}, \hat{c})}{d\hat{c}} \mathcal{J} \Theta(c, x_1, x_2), \quad (1)$$

where the parton densities with *bars* mean the ones modified by the subtraction of the quark mass singularities; the step function $\Theta(c, x_1, x_2)$ defines the phase space domain corresponding to the given event selection procedure. The partonic cross section is taken in the center-of-mass reference frame of the initial quarks, where the cosine of the muon scattering angle, $\hat{c}$ is defined. The transformation into the observable variable c involves the Jacobian:

$$\mathcal{J} = \frac{\partial \hat{c}}{\partial c} = \frac{4x_1 x_2}{a^2}, \quad a = x_1 + x_2 - c(x_1 - x_2), \\ \hat{c} = 1 - (1 - c) \frac{2x_1}{a}, \quad \hat{s} = s x_1 x_2. \quad (2)$$

An analogous formula can be written for any other choice of a differential distribution as well as for the total cross section.

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