

# PPFX hardonic interaction procedure

Antoni Aduszkiewicz

University of Houston

March 19, 2021

# Introduction

- I list the hadron production correction procedure formulae from Leo thesis, mostly section 4.2. Equation numbering corresponds to the one used in the thesis.
- Each of the correction steps introduces a systematic uncertainty, related to the procedure for deriving each correction, as well as statistics of measured and simulated datasets.

## Corrections related to total cross-section

### 1 Survival correction

$$c_{\text{surv.}}(r) = \frac{\sigma^{\text{data}}}{\sigma^{\text{MC}}} \cdot \exp \left[ -r \frac{N_A \rho (\sigma^{\text{data}} - \sigma^{\text{MC}})}{A} \right]. \quad (4.7)$$

### 2 Attenuation correction

$$c_{\text{att.}}(r) = \exp \left[ -r \frac{N_A \rho (\sigma^{\text{data}} - \sigma^{\text{MC}})}{A} \right]. \quad (4.6)$$

These two corrections are not too controversial. Unless we question MC geometrical model, only uncertainty comes from the total cross-section value as a function of the collision energy.

## Corrections of the spectrum shape

- 3 Correction for MC spectrum inaccuracy

$$c_{\text{spec.}}(\vec{p}) = \frac{N^{\text{data}}(\vec{p})}{N^{\text{MC}}(\vec{p})}. \quad (4.4)$$

What is  $N$ ? We're trying to determine that during the last months.

- 4 Correction for spectrum shape dependence on energy

$$c_{\text{e-dep.}}(\vec{p}, \sqrt{s}) = \frac{\sigma^{\text{data}}(\vec{p}, \sqrt{s^{\text{data}}})}{\sigma^{\text{MC}}(\vec{p}, \sqrt{s^{\text{data}}})} \cdot \text{scale}(\vec{p}, \sqrt{s}) \cdot \left( \frac{\sigma^{\text{data}}}{\sigma^{\text{MC}}} \right), \quad (4.8/4.9)$$

where

$$\text{scale}(\vec{p}, \sqrt{s}) = \frac{\sigma^{\text{MC}}(\vec{p}, \sqrt{s})}{\sigma^{\text{MC}}(\vec{p}, \sqrt{s^{\text{data}}})}. \quad (1)$$

These two corrections are controversial. As we demonstrated last months taking into account the limited resolution of the measured data.