notes on bin normalization in SIDIS fit

We implement a normalization for every bin of our data. For SIDIS, data in the same bin are characterized by their value of (x, Q^2, z). Drell-Yan data instead are distinguished by their value of m. Z data are simply separated by their experiment. In total we have 464 bins for SIDIS, 20 for DY and 4 for Z data. In total our data are divided in 488 bins (n_{bin}).
For the calculation of χ^2 we want to use the following formula:

$$\chi^2 = \sum_i^{n_{bin}} \sum_j^{n_i} \frac{\left(N_i \sigma_{th,ij} - \sigma_{exp,ij}\right)^2}{\Delta\sigma_i j^2} \tag{1}$$

where i denotes the bin considered, n_i is the number of data in the i bin and N_i is the normalization that we want to apply.
This normalization are chosen in a way to minimize the contributions to χ^2:

$$\frac{\partial \chi^2}{\partial N_i} = 0 \tag{2}$$

We try to derive the explicit expression of N_j for a specific bin k:

$$\frac{\partial \chi^2}{\partial N_j} = \sum_j^{n_k} \frac{\left(N_k \sigma_{th,kj} - \sigma_{exp,kj}\right)^2}{\Delta\sigma_{kj}^2} = \tag{3}$$

$$= \sum_j^{n_k} \frac{2\left(N_k \sigma_{th,kj} - \sigma_{exp,kj}\right)}{\Delta\sigma_{kj}^2} \cdot \sigma_{th,kj} = 0 \tag{4}$$

and we obtain the following expression to calculate N_k:

$$N_k = \sum_j^{n_k} \frac{\sigma_{exp,kj}\sigma_{th,kj}}{\Delta\sigma_{kj}^2} \Bigg/ \sum_j^{n_k} \frac{\sigma_{th,kj}^2}{\Delta\sigma_{kj}^2} \,. \tag{5}$$