Calculation of Coulomb interacting Bose-Einstein correlations in Fourier space

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Bose-Einstein correlation function

- Source function: $S(x,p)$
- Single- and two-particle momentum distributions:

$$N_1(p),\ N_2(p_1,p_2)$$

- Bose-Einstein corr. function:

$$C_2(p_1,p_2) = \frac{N_2(p_1,p_2)}{N_1(p_1)N_1(p_2)}$$

- Non-interacting particles:

$$C_2(\boldsymbol{k},\boldsymbol{K}) = 1 + \frac{\left|\tilde{S}\left(2\boldsymbol{k},\ \frac{\boldsymbol{K}}{2}\right)\right|^2}{\left|\tilde{S}\left(2\boldsymbol{k},\ \frac{\boldsymbol{K}}{2}\right)\right|^2}$$

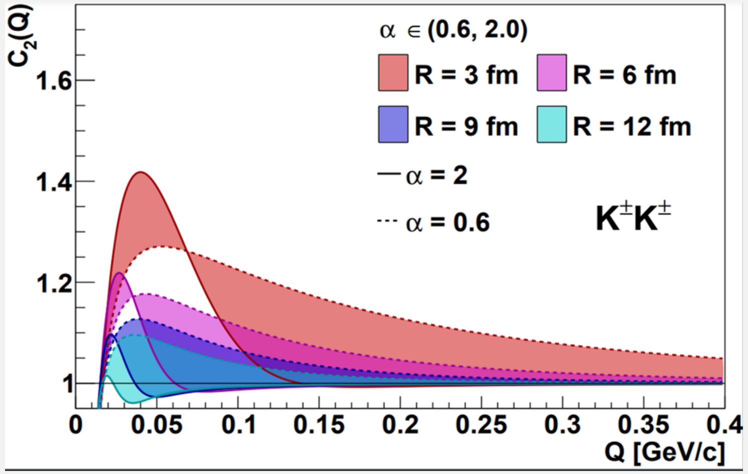
New formula for Lévy-stable sources

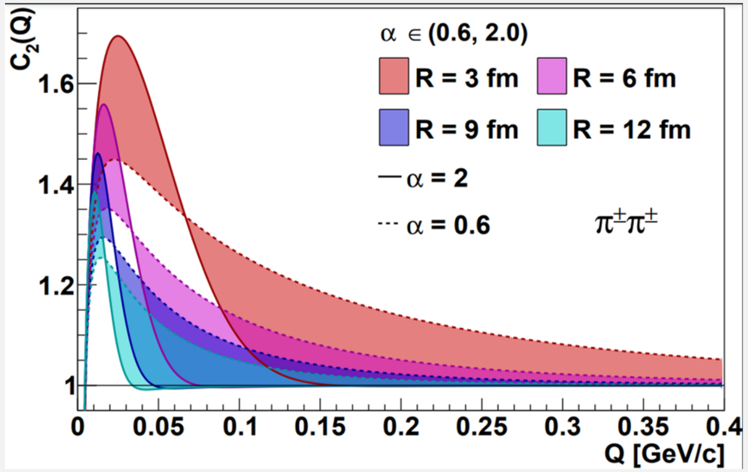
- Koonin-Pratt formula:

$$C_2(k) = \int d^3r\, D(r)|\psi_k(r)|^2$$

- Key assumptions: spherical symmetry and Lévy-stable distribution of the source
- Calculation was done by inserting an exponential „regularization", $e^{-\lambda r}$, and taking $\lambda \to 0$ at the end
- Result :

$$C_2(k) = |\mathcal{N}|^2 \left(1 + f_s(2k) + \frac{\eta}{\pi}[\mathcal{A}_{1s} + \mathcal{A}_{2s}]\right)$$





Comparison with the original numerical method

- Previous method: the values of the correlation function were pre-calculated for various parameters, and saved in a large table
- New method: simple and more exact handling of the Coulomb final state interaction
- Natural next step: extend the methodology to non-spherical sources