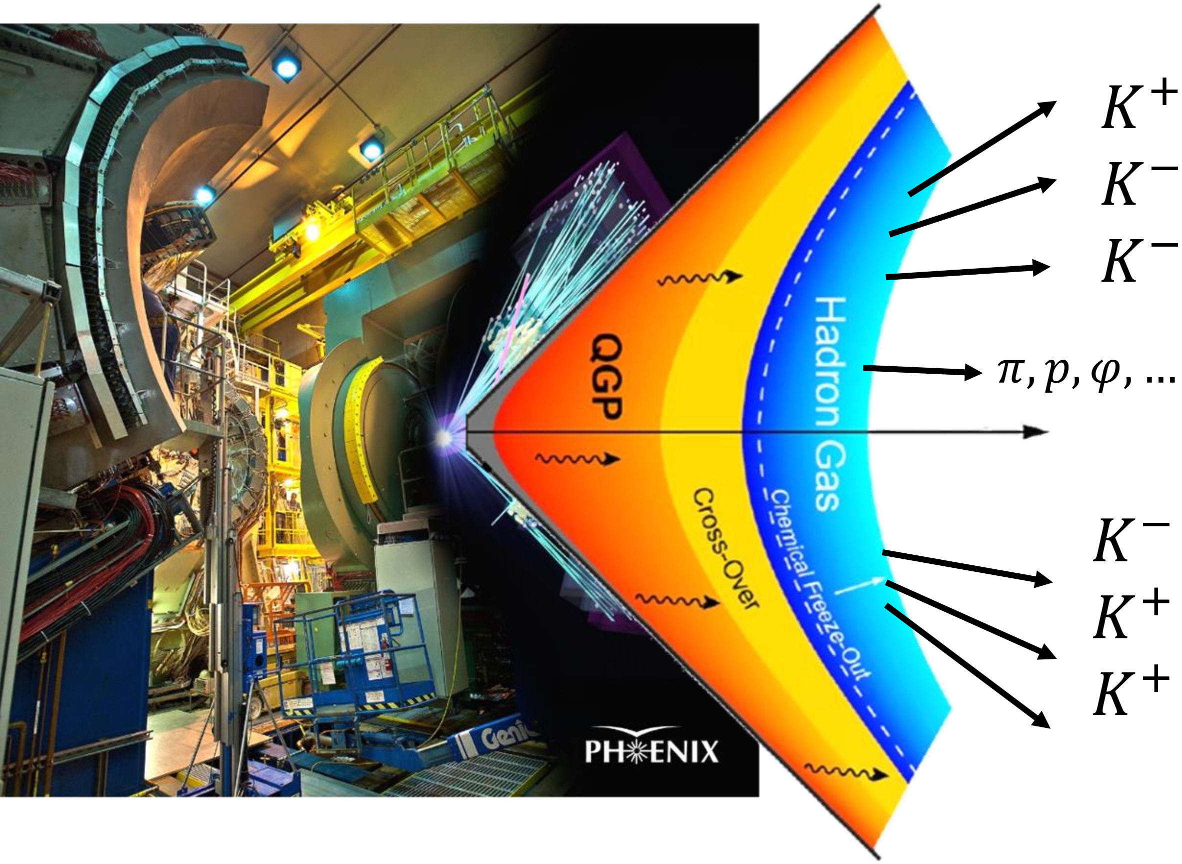
Femtoscopic correlation of kaons



Hanbury-Brown and Twiss: intensity correlation

Goldhaber et al. in HEP

Access the spatio-temporal structure of the particle emitting source

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

use Yano-Koonin formula to relate the momentum distribution to the emitting source

$$\underbrace{\boldsymbol{N_2(p_1, p_2)}}_{\text{Two-particle momentum distr.}} = \int \underbrace{\boldsymbol{dx_1 dx_2}}_{\text{Space-time coordinates}} \underbrace{\boldsymbol{S(x_1, p_1) S(x_2, p_2)}}_{\text{Source functions}} \underbrace{\boldsymbol{|\Psi_2(x_1, x_2)|^2}}_{\text{Two-particle wavefunction}}$$

Two-particle momentum distr.

Space-time coordinates

Source functions
What shape?

Two-particle wavefunction
FSI here, i.e., Coulomb, strong

On the shape of the correlation function

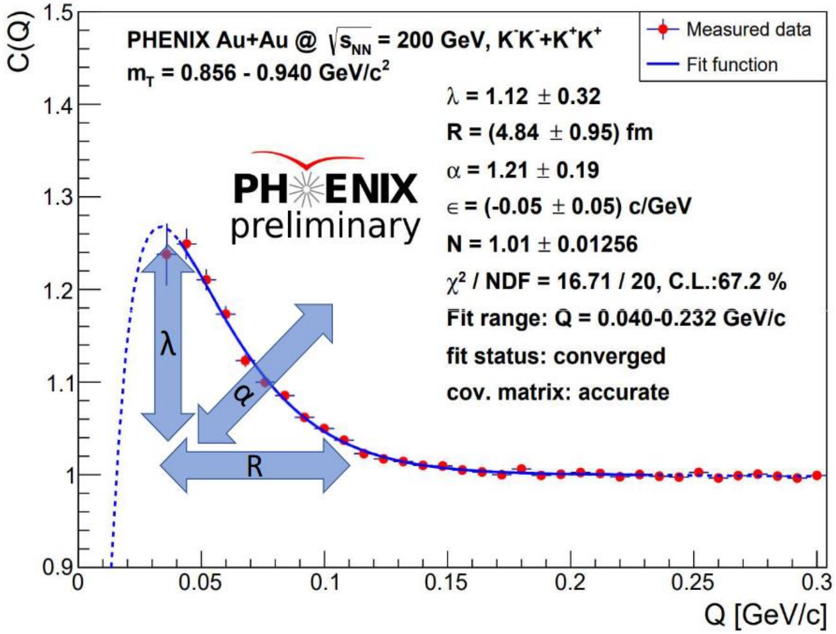
Generalized Gaussian – Levy distribution

$$\mathcal{L}(\alpha, R, r) = \frac{1}{(2\pi)^3}\int d^3q\; e^{iqr} e^{-\frac{1}{2}|qR|^\alpha}$$

Rel. mom. in LCMS
1D variable!

$\alpha = 2$: Gaussian, $\alpha = 1$: Cauchy, $0 < \alpha \leq 2$: Levy

Assume the source to be Levy! $\Rightarrow$ Correlation: $\boldsymbol{C_2(Q) = 1 + \lambda e^{(RQ)^\alpha}}$



Distortion effects:
Coulomb, strong FSI to be included!
Resonances, coherence, ...

$\lambda(K)$: core-halo parameter
$R(\mathrm{K})$: Levy-scale parameter
$\alpha(K)$: Levy index of stability

Experimental results from PHENIX

- π: 0-30% centrality selection
- K: minimum bias, still comparable
- Levy-index agree for π and K $\Rightarrow$ common Levy-process?
- Core-halo parameter: π and K compatible
- Levy-scale parameter: hydro scaling,
- π and K compatible, despite $R_{Levy} \neq R_{Gauss}$