Status of p-d femtoscopy

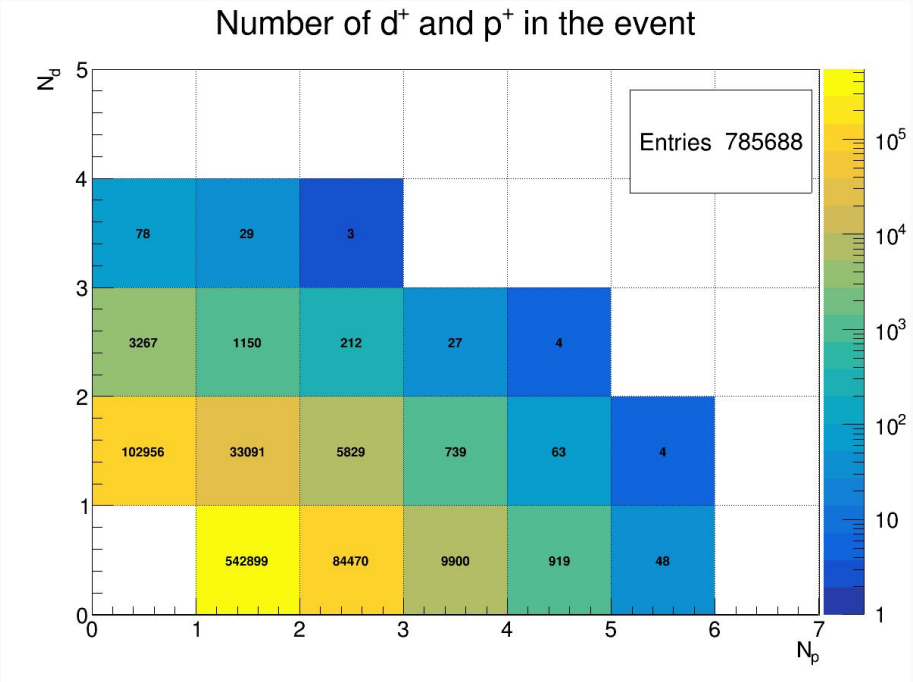
P. Alekseev, L.Kovachev, A. Stavinsky, N. Zhigareva
for BM@N collaboration

11th Collaboration Meeting of the BM@N Experiment at the NICA Facility

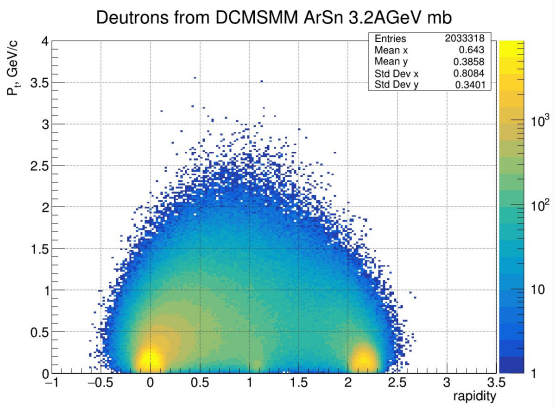
BM@N period 7, 3.2 AGeV Ar-beam, identified on TOF-700 data

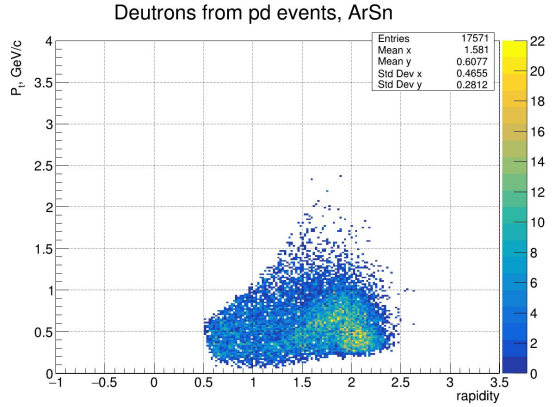
2 725 618 entries

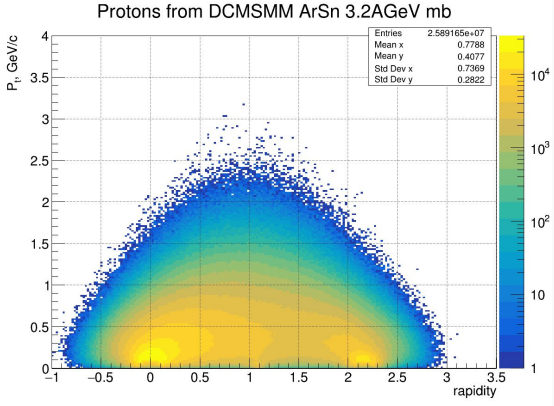
Target		p^+	d^+	p^+d^+
C	Carbon	30 668	5 682	1 586
Al	Aluminum	165 536	31 218	9 839
Cu	Copper	214 483	40 742	13 265
Sn	Tin	250 947	48 464	17 571
Pb	Lead	132 765	26 226	8 424
Total		794 399	152 332	50 685

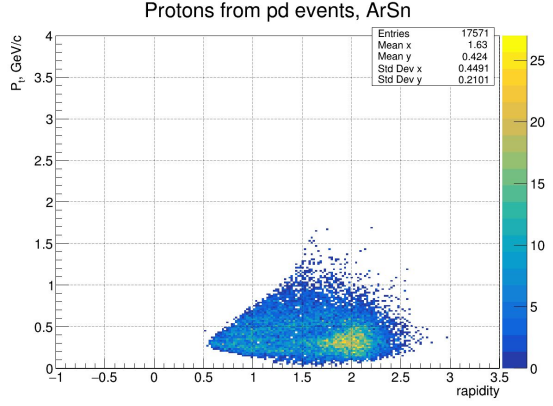


P_t vs rapidity. ArSn 3.2 AGeV DCMSMM and exp. data

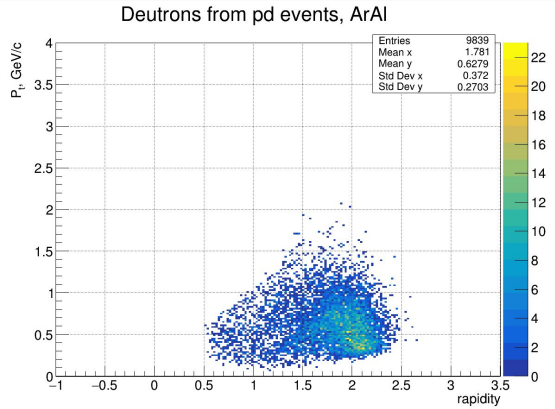


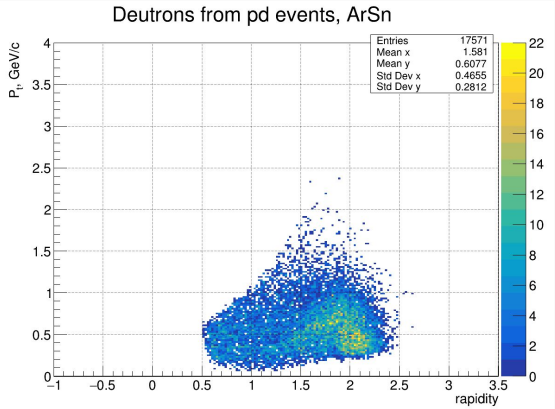


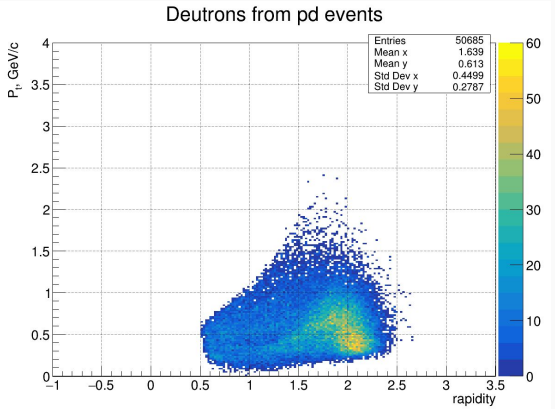


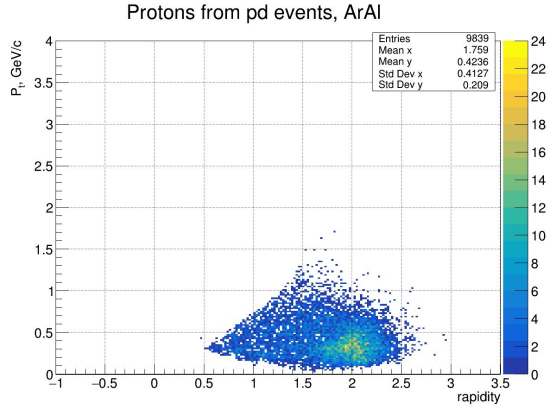


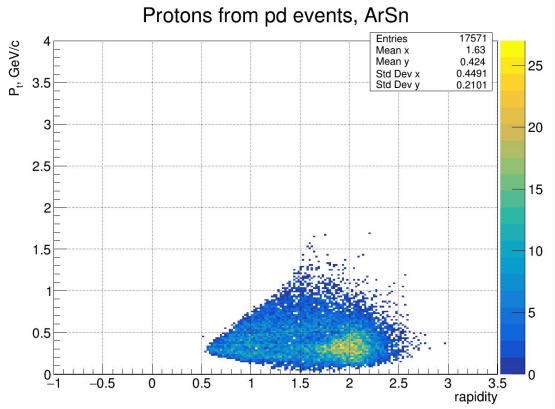
P_t vs rapidity. ArSn, ArAl, all targets

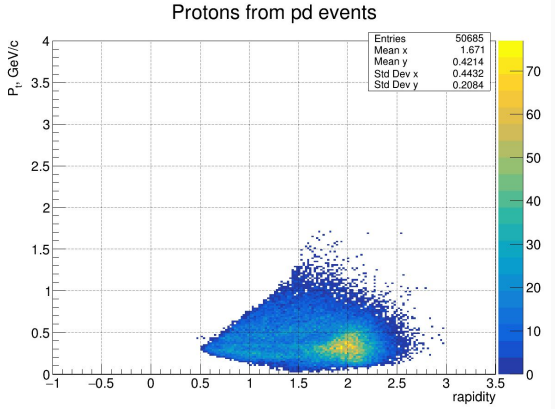




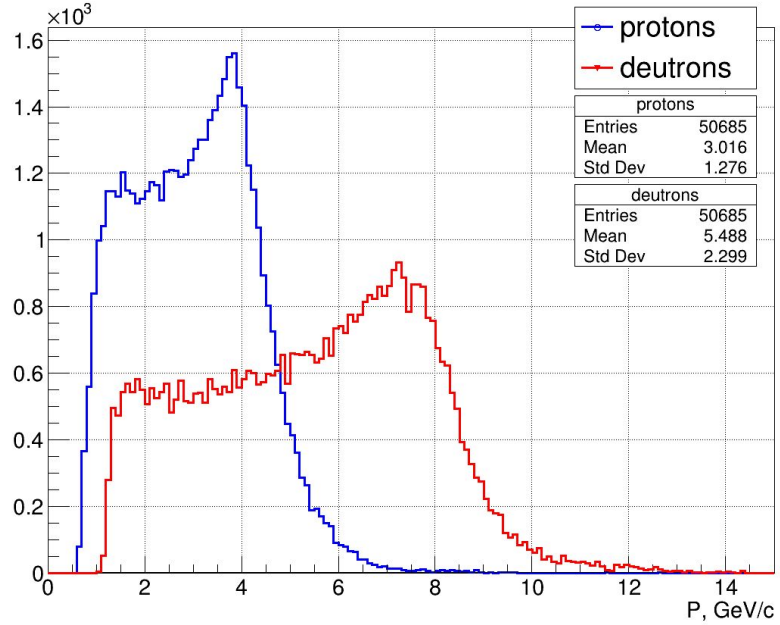


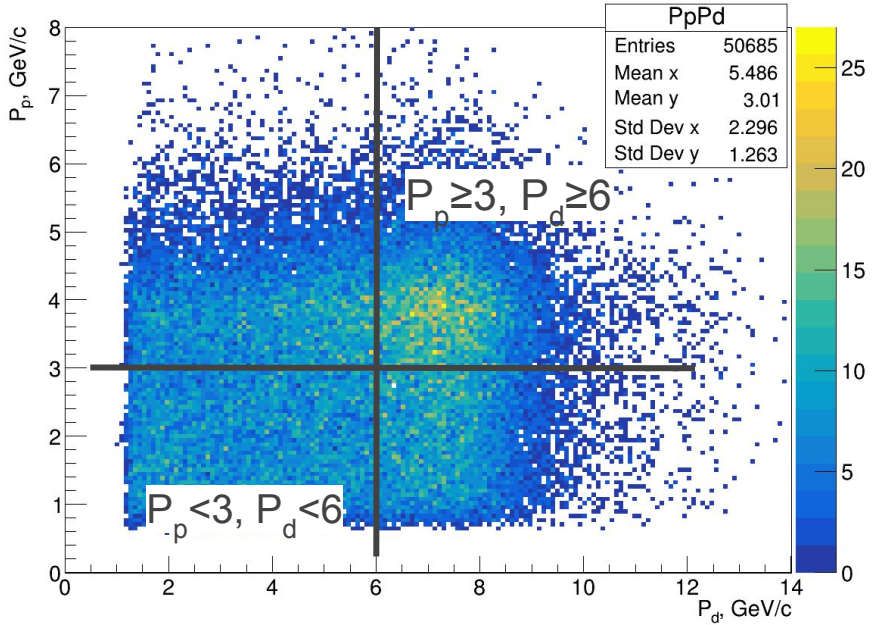






Momentum spectra





Correlation function

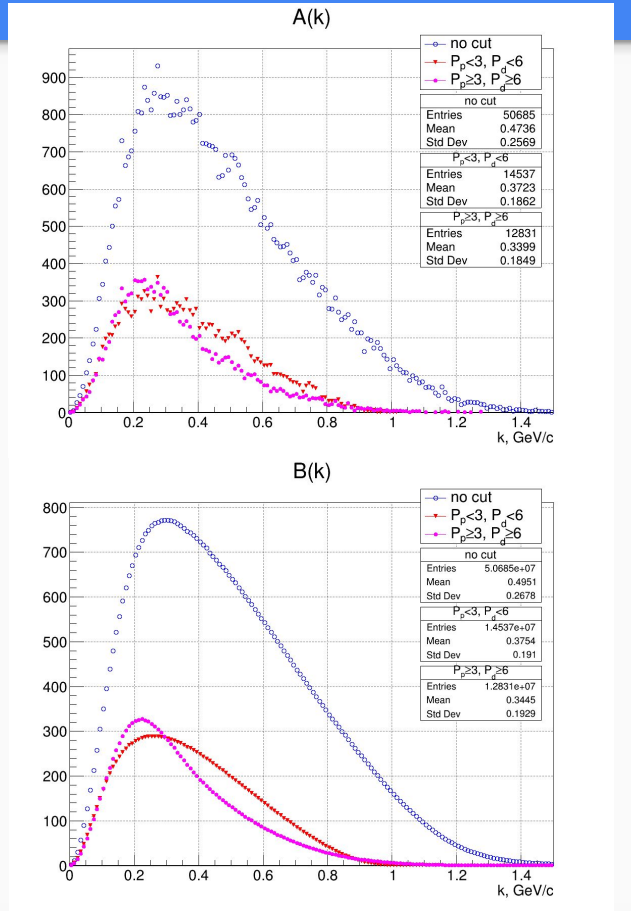
$$C(k^*) = \frac{A(k^*)}{B(k^*)}$$

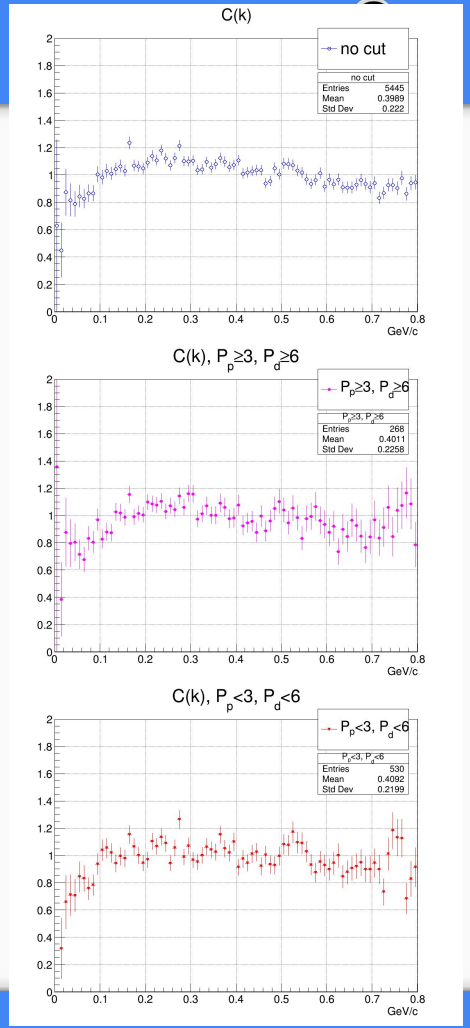
$$k^* = \frac{1}{2} \cdot |p_1^* - p_2^*|$$

Status of baryon femtoscopy at BM@N

L.Kovachev, A.Stavinskiy for BM@N collaboration

10th Collaboration Meeting of the BM@N Experiment at NICA Facility, 14-19 May 2023





pd correlation function

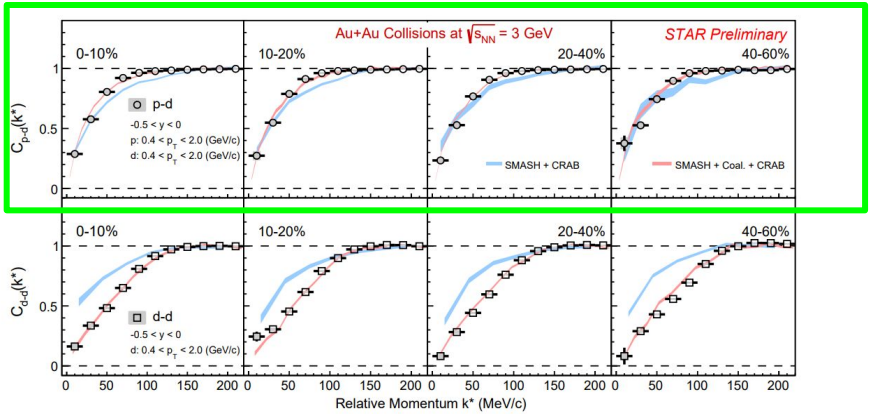
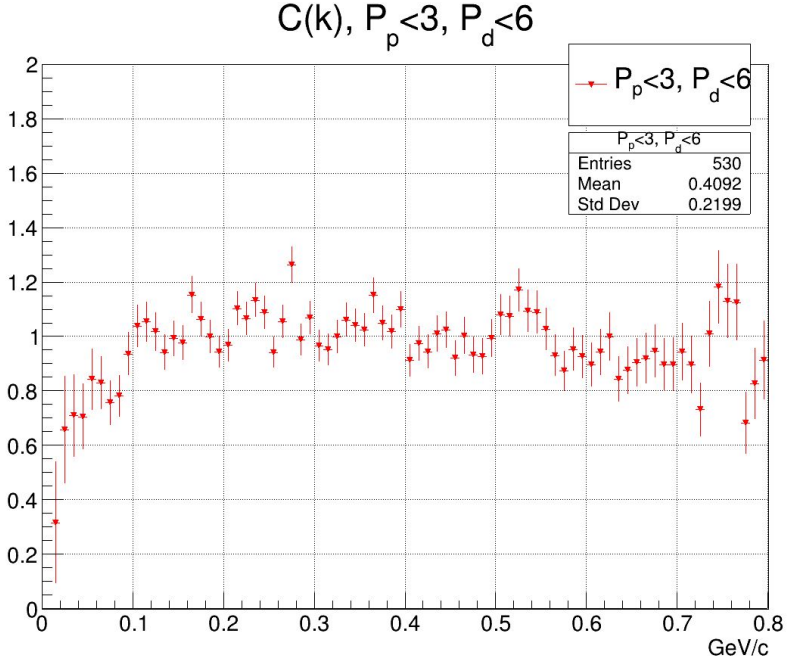
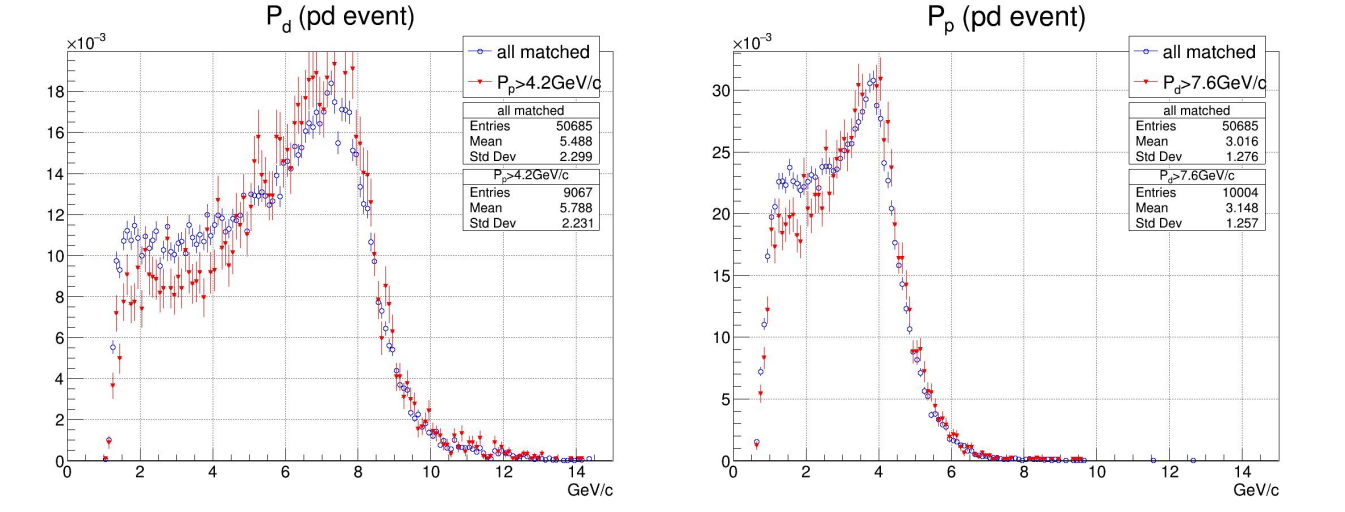


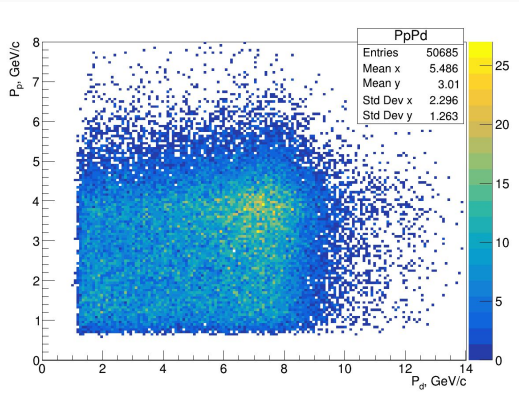
Fig. 4. The $p-d$ and $d-d$ correlation functions in different collision centralities in Au+Au collisions at $\sqrt{s_{NN}} = 3\,\text{GeV}$. The statistical and systematic errors are shown as vertical lines and grey bands, respectively. The colored bands represent the $p-d$ and $d-d$ correlations obtained with the deuteron from nucleon coalescence (red) in SMASH and directly produced from SMASH via hadronic scattering (blue), respectively.



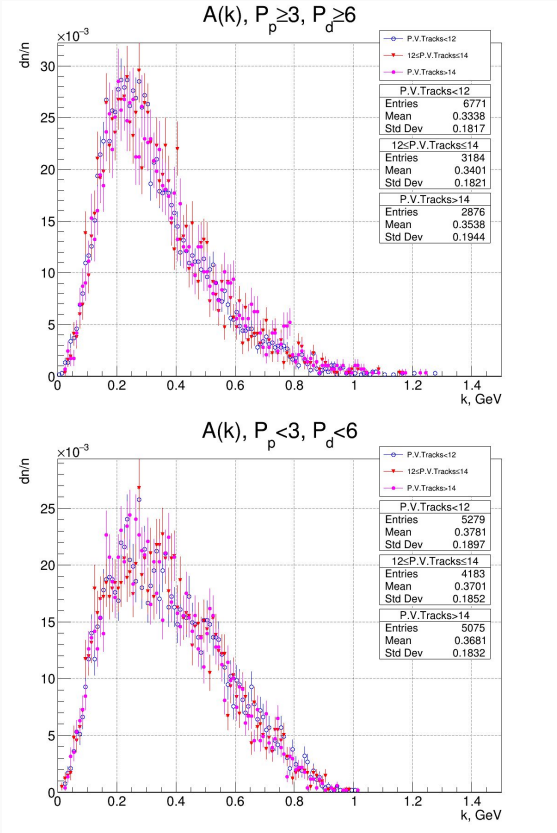
[STAR-(BES) ArXiv:2208.05722[nucl-ex],QM2022]

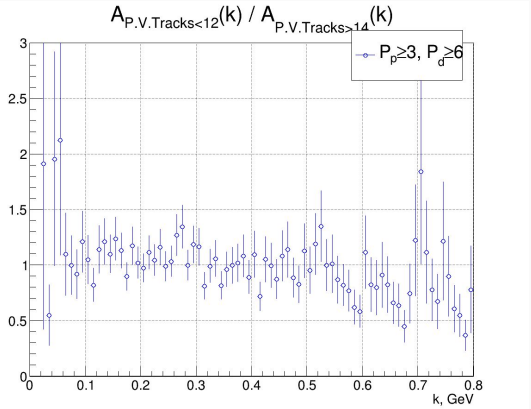
Correlation of proton and deutron momentum

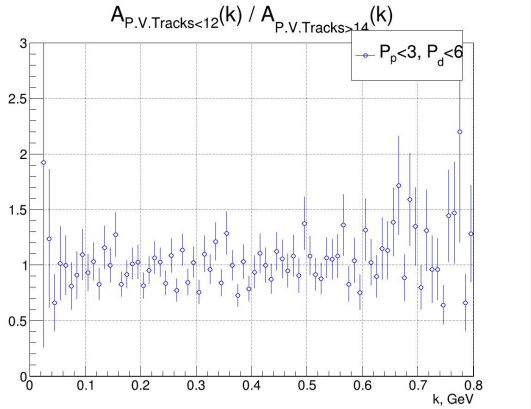




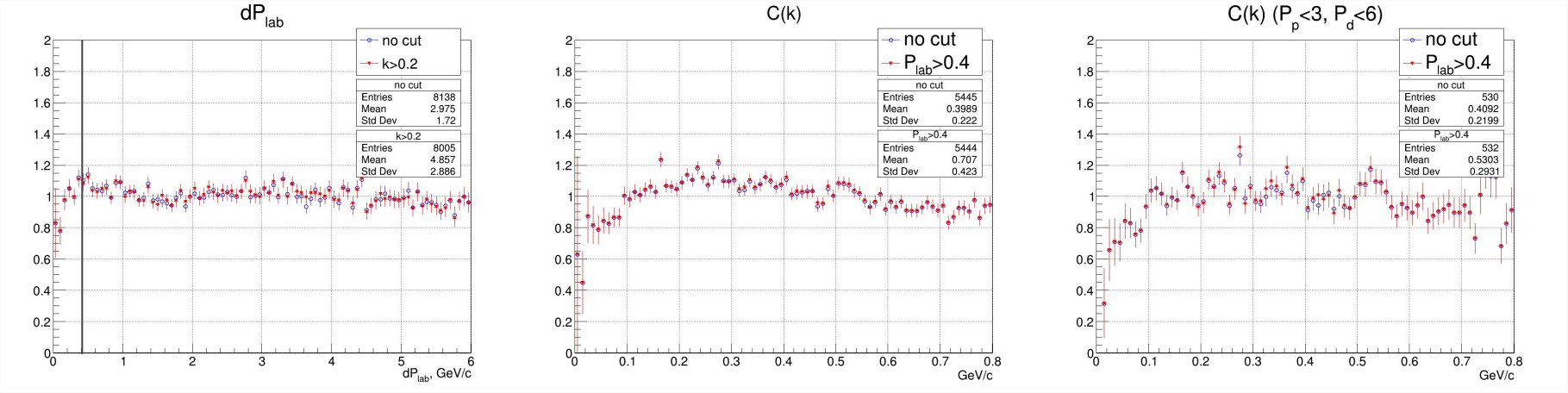
Estimation of multiplicity dependency







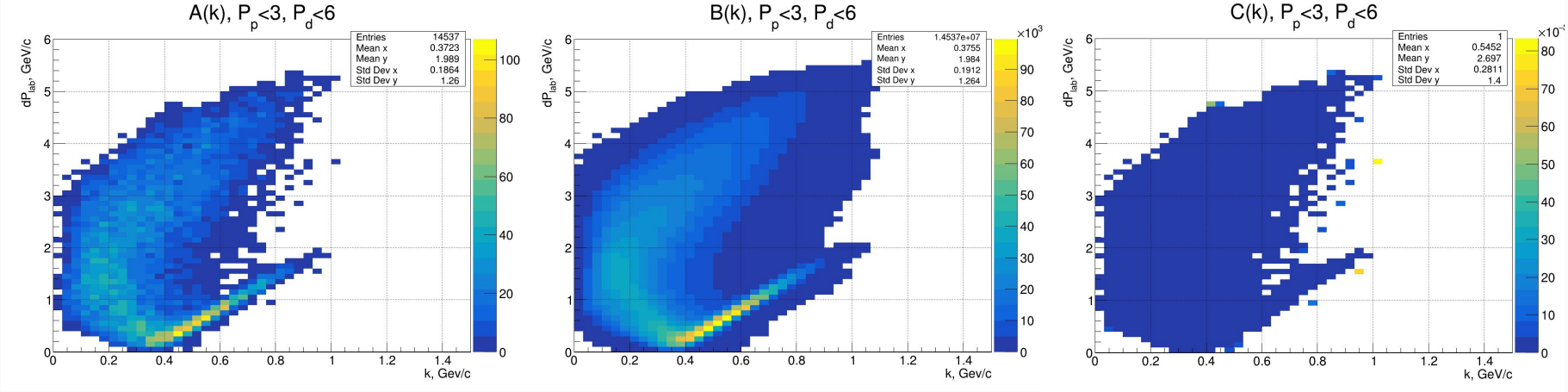
Efficiency of closest tracks



Registered p-d pairs dP_{lab} relative to the mixing

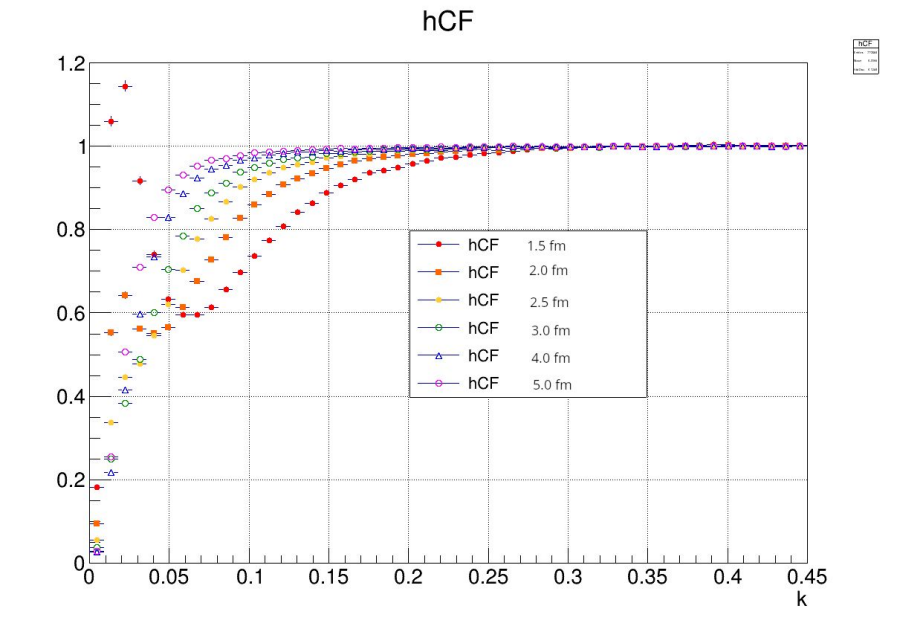
Excluding low-efficiency area by dP_{lab} has no significant effect on the range of interest (k < 200 MeV/c)

dP_{lab} vs k


A(k), P_p<3, P_d<6
Entries 14537
Mean x 0.3723
Mean y 1.989
Std Dev x 0.1864
Std Dev y 1.26
dP_lab, GeV/c
k, Gev/c
B(k), P_p<3, P_d<6
Entries 1.4537e+07
Mean x 0.3755
Mean y 1.984
Std Dev x 0.1912
Std Dev y 1.264
dP_lab, GeV/c
k, Gev/c
C(k), P_p<3, P_d<6
Entries 1
Mean x 0.5452
Mean y 2.697
Std Dev x 0.2811
Std Dev y 1.4
dP_lab, GeV/c
k, GeV/c

Conclusion

1. Correlation functions of p-d are make sense for Ar data
2. Next step is to apply detector resolution to the theoretical curves
3. Then compare the resulting curves with experimental data points
4. Information on efficiency from p-d may be applied to p-p
5. The methodic developed will be used on Xe data of the last BM@N period



Theoretical curves were obtained using the R. Lednicki code.

Thank you for attention!

dP_{lab} vs k (lower area)