ϕ SDME study

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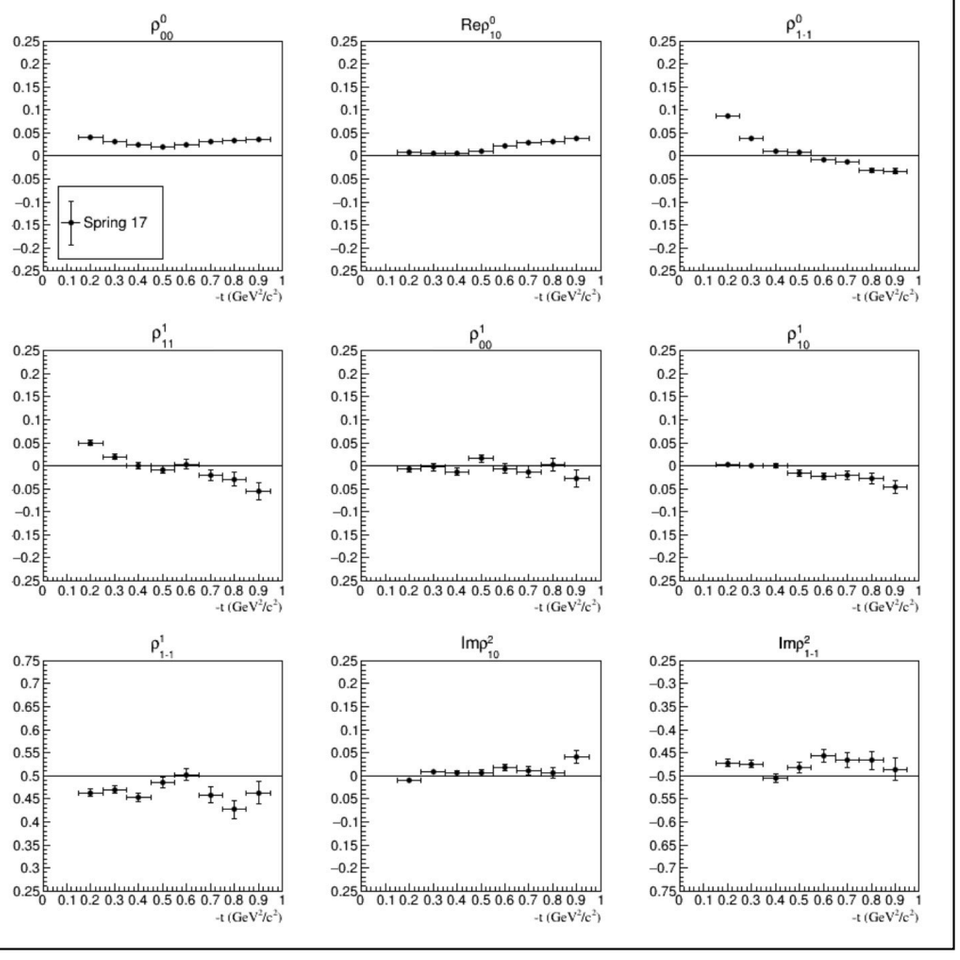
Tracking Meeting

30-Mar-2023

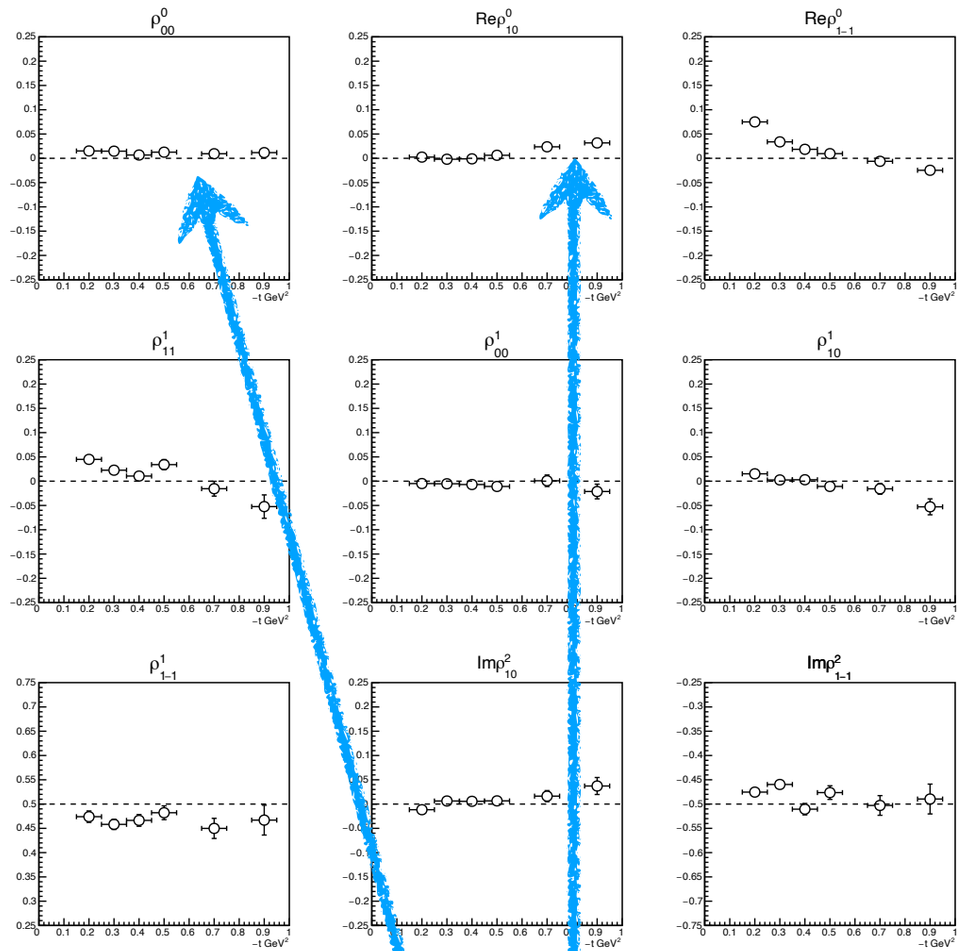
Comparison between GlueX-I and 2020 data using ϕ→K+K-

Naomi's results
https://halldweb.jlab.org/DocDB/0055/005570/001/NSJ_phi_AA_2May2022.pdf

SDME from measured data, spring 17



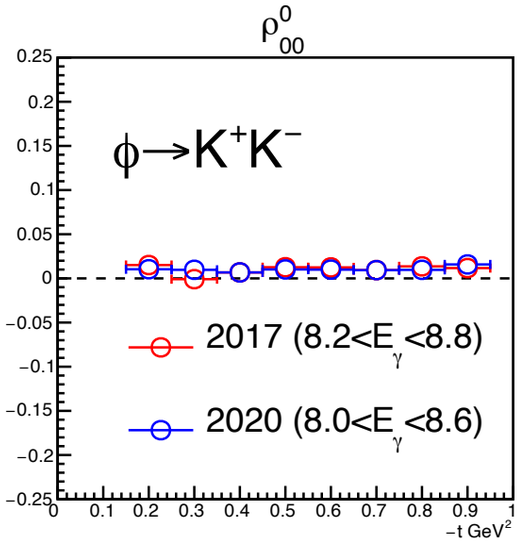
My current analysis results.
Her results are not fully reproduced yet.

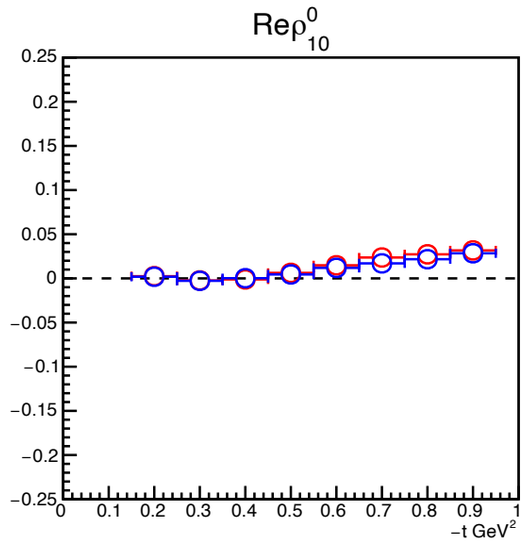


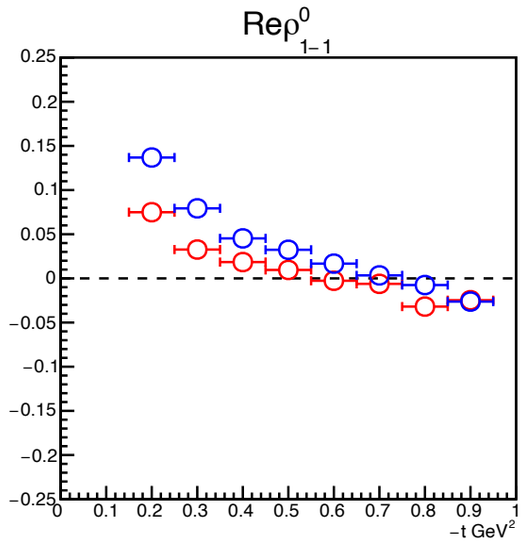
NB: tagger accidentals are injected in MC data (this should be removed for AmpTools analysis)
"Generated 4-vectors" after the standard event selection are used for AmpTools input.

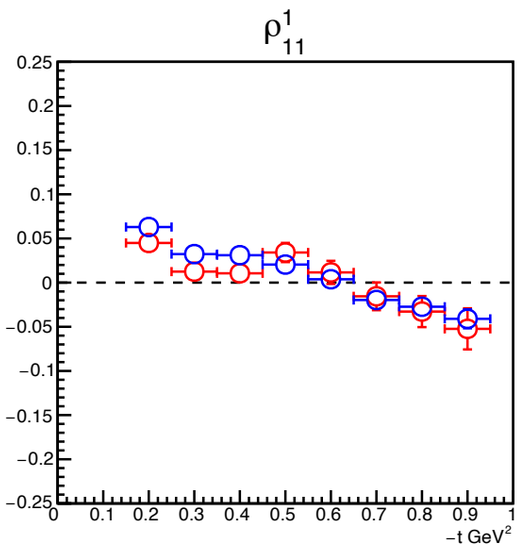
These missing points are because of the initial parameters.

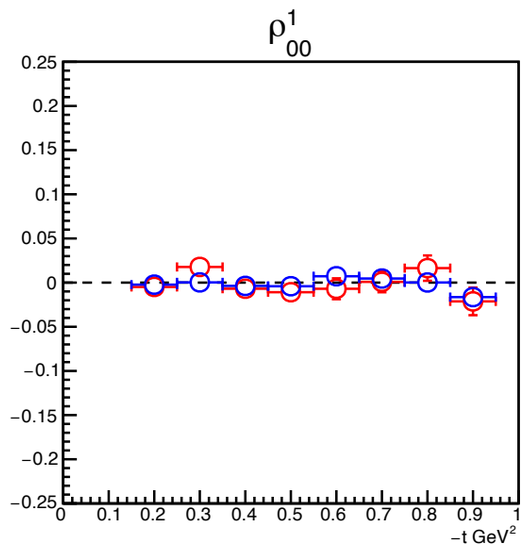
ϕ SDME

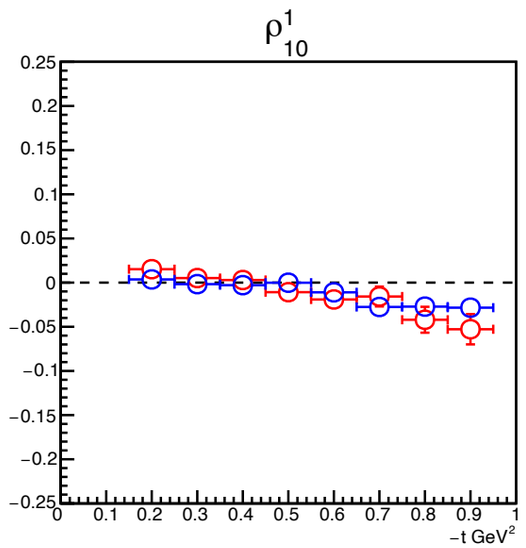

ρ^0_{00}
$\phi \to K^+K^-$
2017 (8.2<E$_\gamma$<8.8)
2020 (8.0<E$_\gamma$<8.6)
−t GeV^2

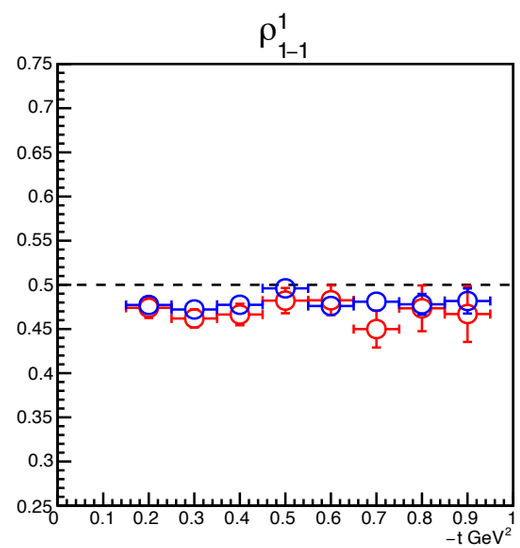

Reρ^0_{10}
−t GeV^2

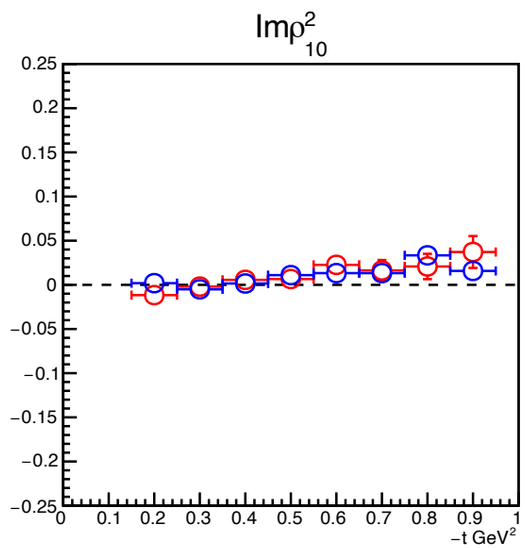

Reρ^0_{1-1}
−t GeV^2

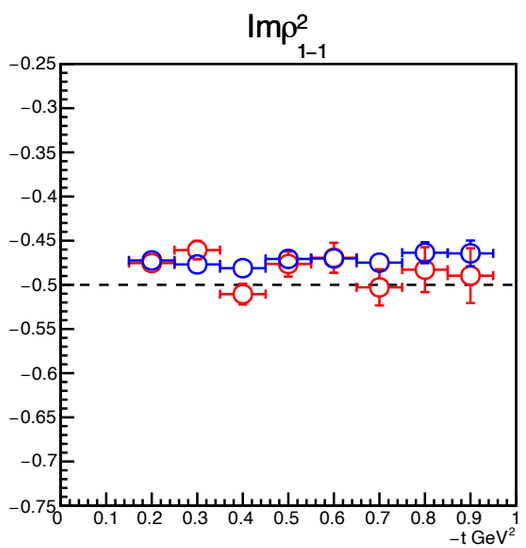

ρ^1_{11}
−t GeV^2


ρ^1_{00}
−t GeV^2

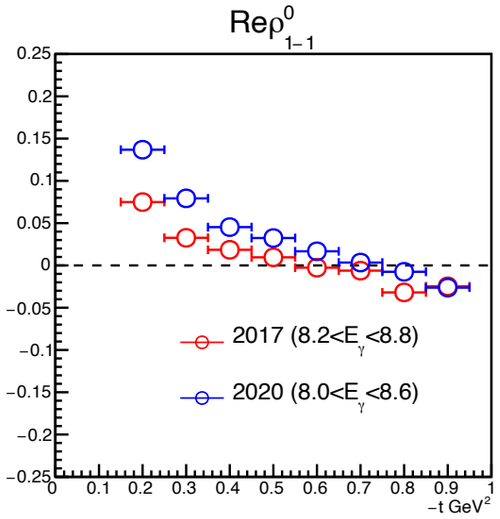

ρ^1_{10}
−t GeV^2


ρ^1_{1-1}
−t GeV^2


Imρ^2_{10}
−t GeV^2


Imρ^2_{1-1}
−t GeV^2

ϕ distributions for ρ^0_{1-1}

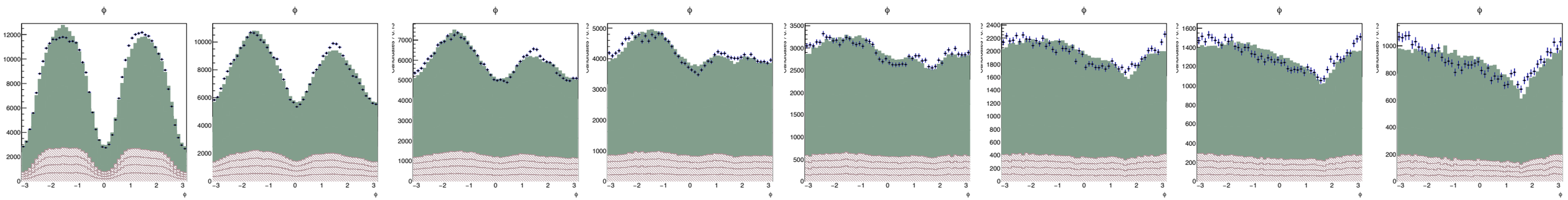


This ϕ is the angle b/w prod. and decay planes in CM frame.

$$W(\phi) = \frac{1}{2\pi}\left(1 - 2\mathrm{Re}\rho^0_{1-1}\cos 2\phi\right)$$

→ -t

2020



2017

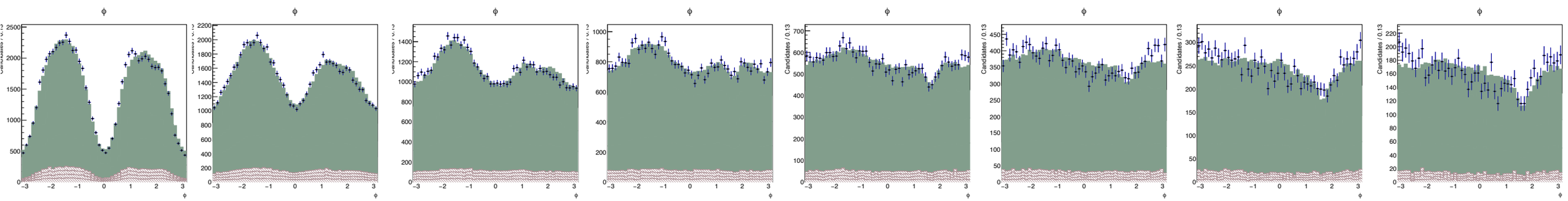
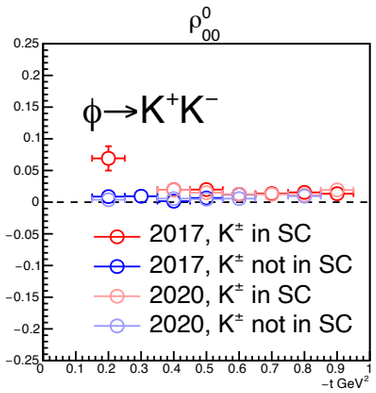


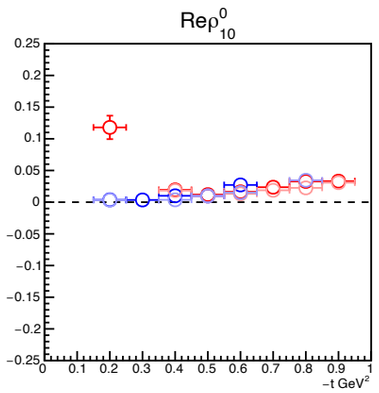
Table 2
Restrictions on the density matrix elements.

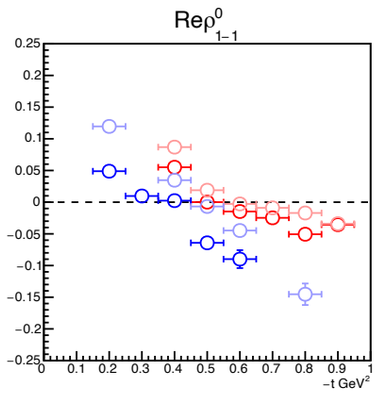
1.	$0 \leqslant \rho^0_{00} \leqslant 1$,
2.	$\lvert\rho^0_{1-1}\rvert \leqslant \frac{1}{2}(1 - \rho_{00})$,
3.	$(\mathrm{Re}\,\rho^0_{10})^2 \leqslant \frac{1}{4}\rho^0_{00}(2 - \rho^0_{00} - \mathrm{Re}\,\rho^0_{1-1})$,
4.	$\lvert\mathrm{Im}\,\rho^3_{1-1}\rvert \leqslant \frac{1}{2}(1 - \rho^0_{00})$,
5.	$\lvert\mathrm{Im}\,\rho^3_{10}\rvert \leqslant \sqrt{\frac{1}{2}\rho^0_{00}(1 - \rho^0_{00})}$,
6.	$\lvert\rho^1_{00}\rvert \leqslant \rho^0_{00}$,
7.	$\lvert\rho^1_{11}\rvert \leqslant \frac{1}{2}(1 - \rho^0_{00})$,
8.	$\lvert\rho^1_{1-1}\rvert \leqslant \frac{1}{2}(1 - \rho^0_{00})$,
9.	$\lvert\mathrm{Re}\,\rho^1_{10}\rvert \leqslant \sqrt{\frac{1}{2}\rho^0_{00}(1 - \rho^0_{00})}$,
10.	$\lvert\mathrm{Im}\,\rho^2_{1-1}\rvert \leqslant \frac{1}{2}(1 - \rho^0_{00})$,
11.	$\lvert\mathrm{Im}\,\rho^2_{10}\rvert \leqslant \sqrt{\frac{1}{2}\rho^0_{00}(1 - \rho^0_{00})}$,
12.	$(\mathrm{Re}\,\rho^0_{10} \pm \mathrm{Re}\,\rho^1_{10})^2 \leqslant \frac{1}{8}\left[\left\{\frac{1}{2} + \left(\frac{1}{2}\rho^0_{00} \mp \rho^1_{11}\right) - \left(\rho^0_{1-1} \pm \rho^1_{1-1}\right)\right\}^2 - \left\{\frac{3}{2}\rho^0_{00} \pm \rho^1_{00} \mp \rho^1_{11} + \rho^0_{1-1} \pm \rho^1_{1-1} - \frac{1}{2}\right\}^2\right]$.
13.	it would be too tedious to write down this inequality.

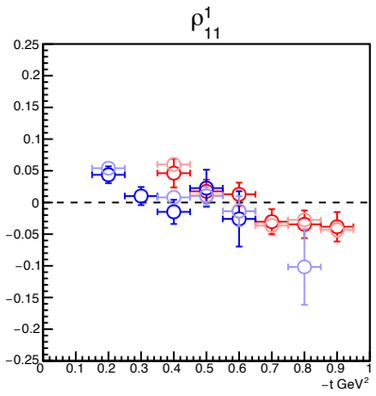
ϕ SDME

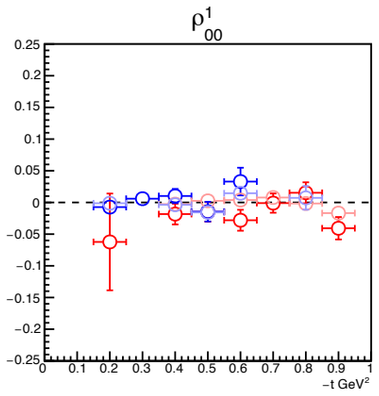
w/o -r option

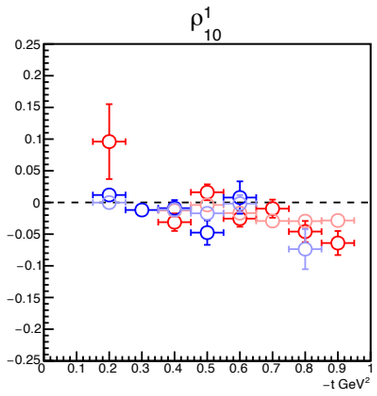


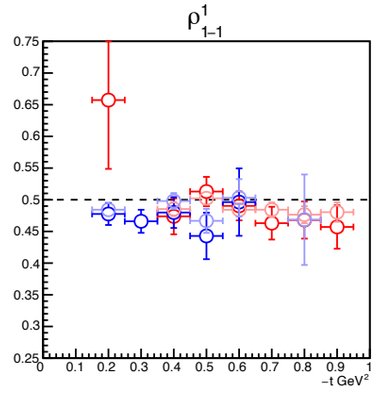


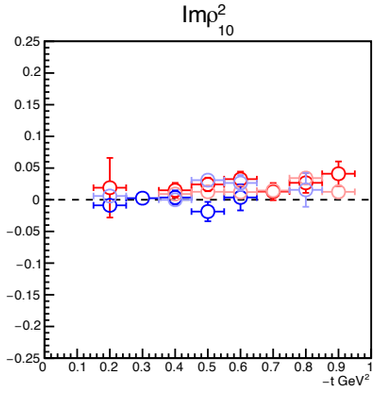


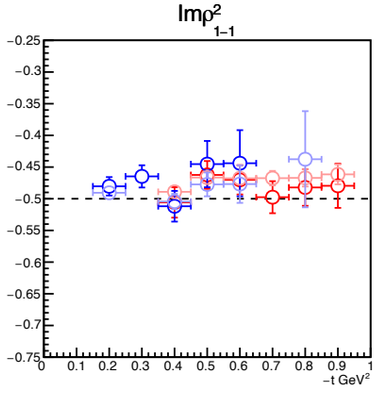




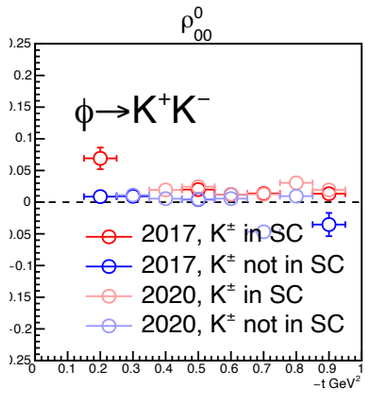


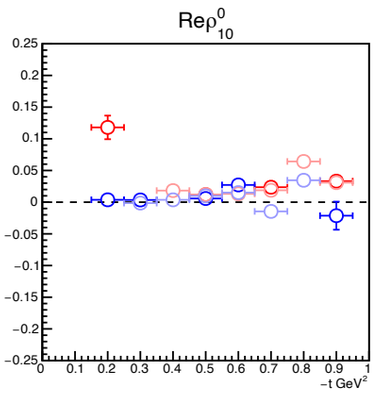


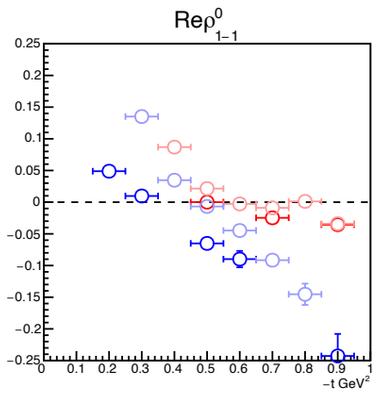


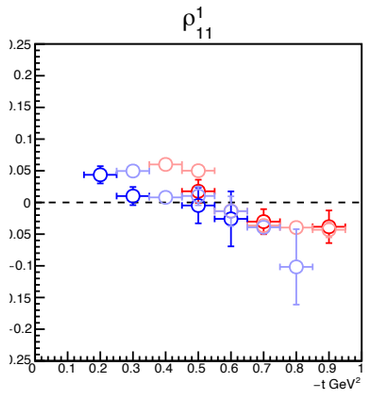


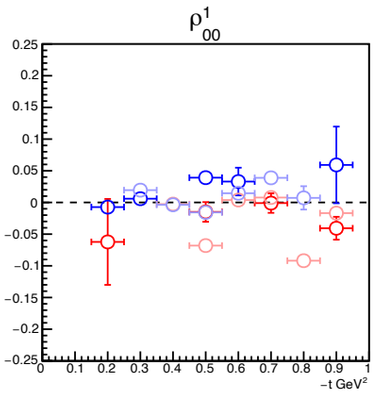
-r 10

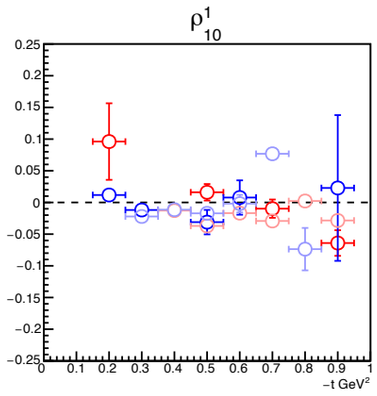


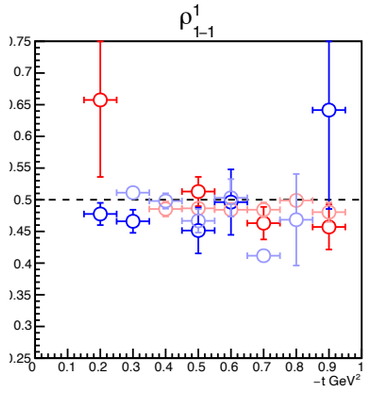


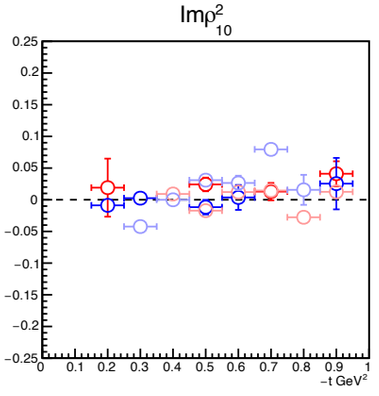


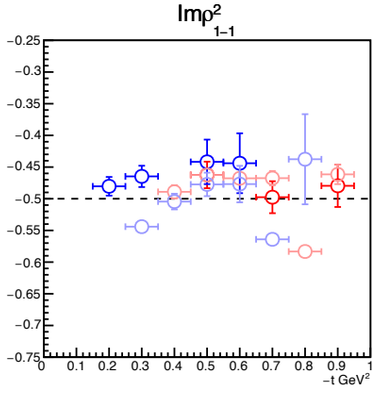












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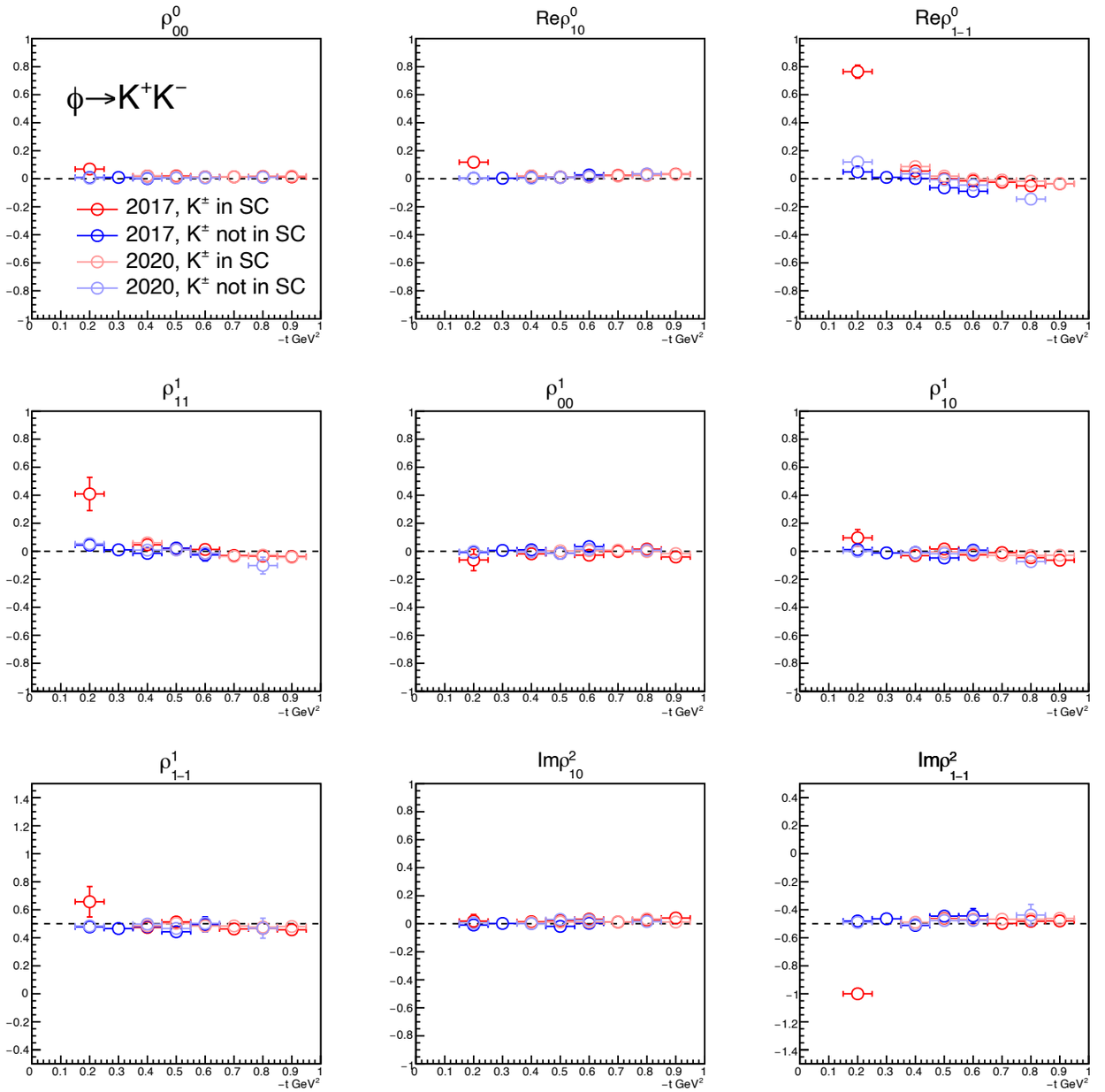
w/o -r option



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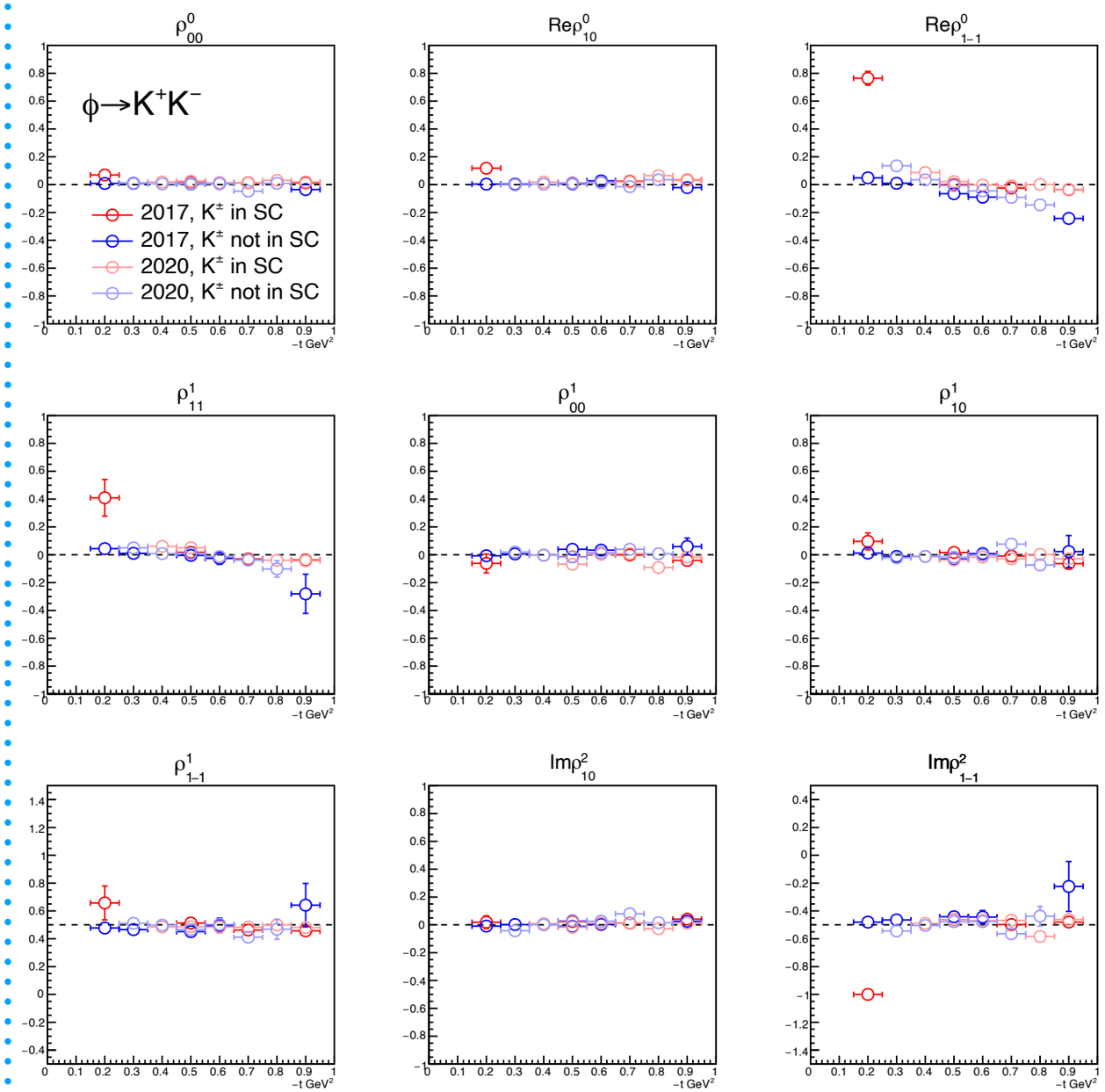

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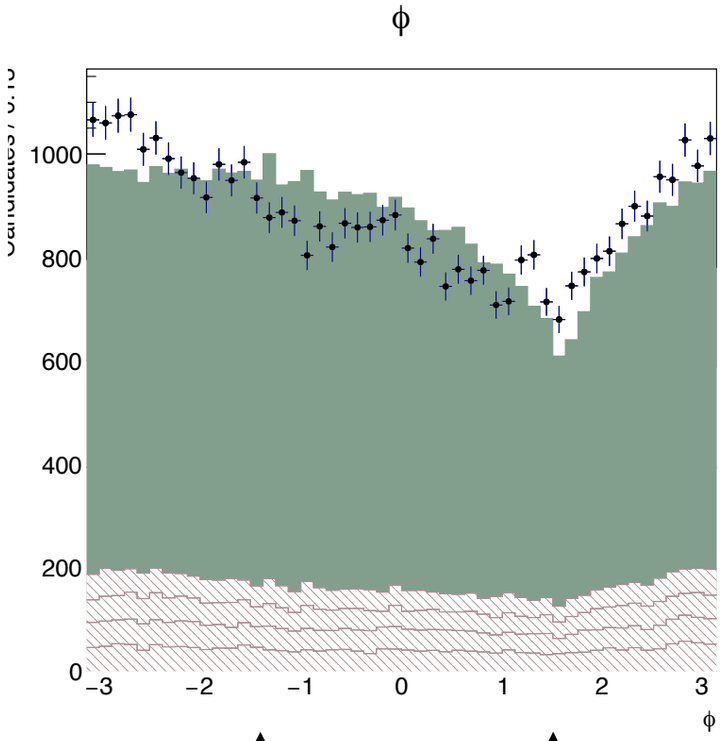

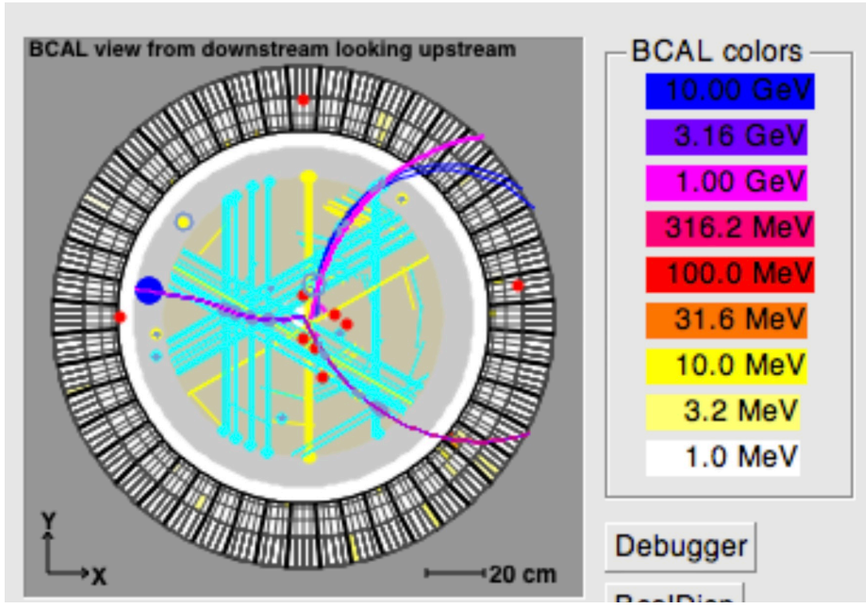

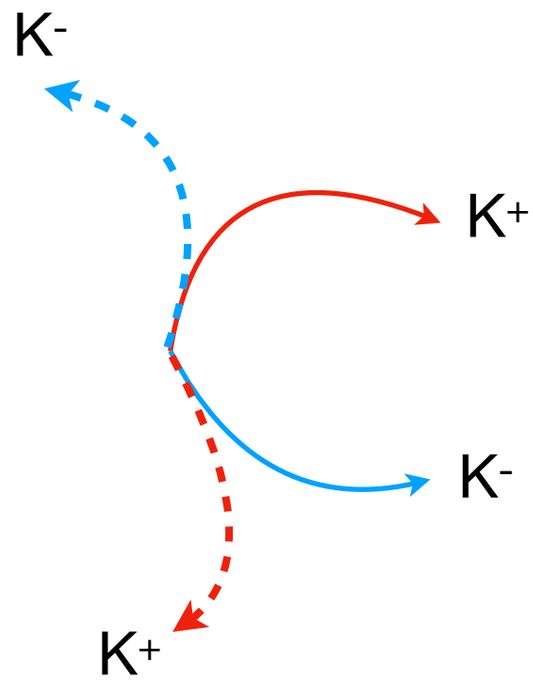

Solid curves: above event
Dotted: the charge is flipped.