# INTERPLAY BETWEEN COLLINS ASYMMETRY AND TWO-HADRON ASYMMETRY

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**on behalf of the COMPASS Collaboration**

# introduction

**first attempt to quantify the "similarity"
among Collins asymmetry for h+ and h-
and hadron pair transverse spin asymmetry**



hadron pairs
released Aug. 2011

Collins
PLB 717 (2012) 376
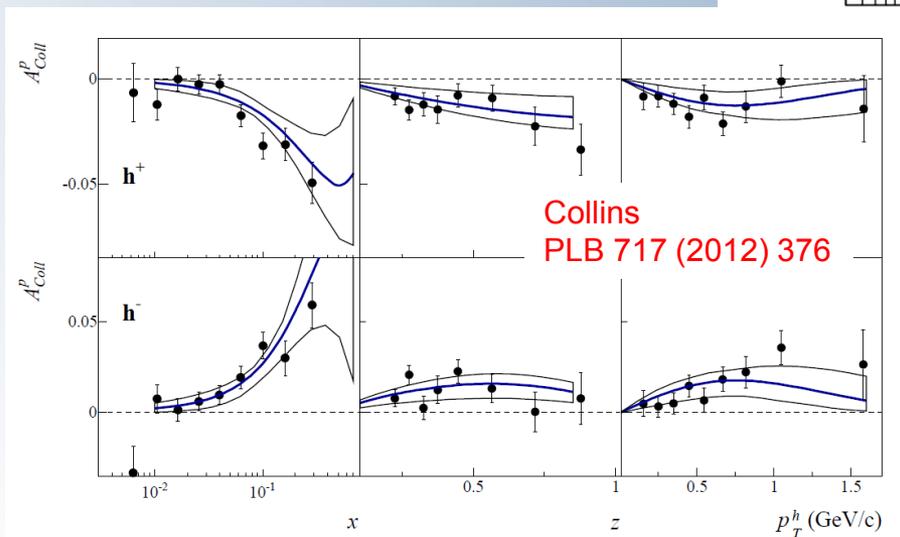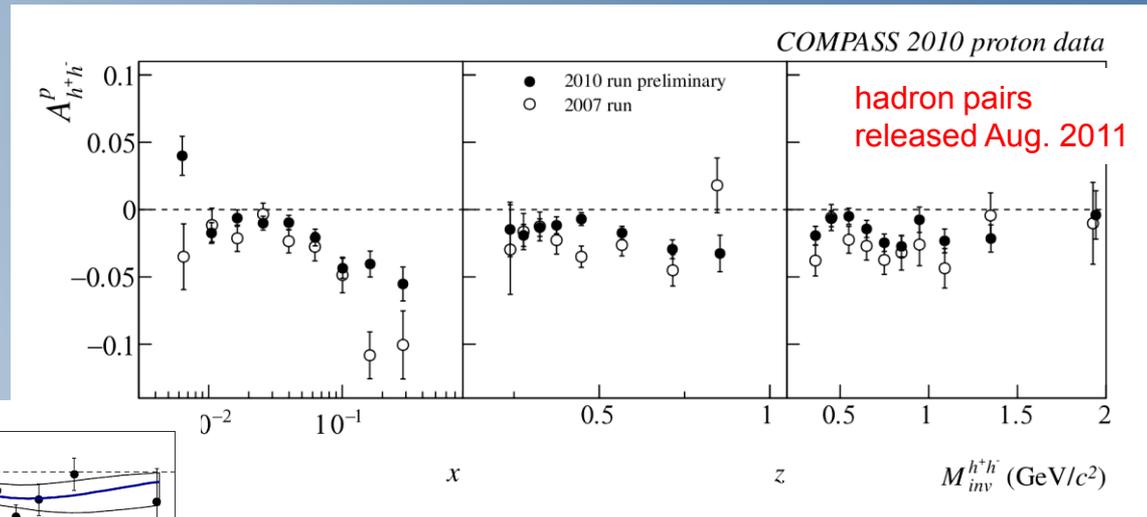
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**two different approaches**

1. **Collins and 2h asymmetries from the same hadron sample
   → information on the ratio of the analysing powers**
   $k_T$ x Collins FF    vs    IFF

2. **correlations between the relevant azimuthal angles and
   corresponding asymmetries
   → information on the nature of the fragmentation**
   Collins vs 2h mechanisms

*preliminay results*

# introduction

**"standard" azimuthal angles**



COMPASS
PRL 94 (2005) 202002
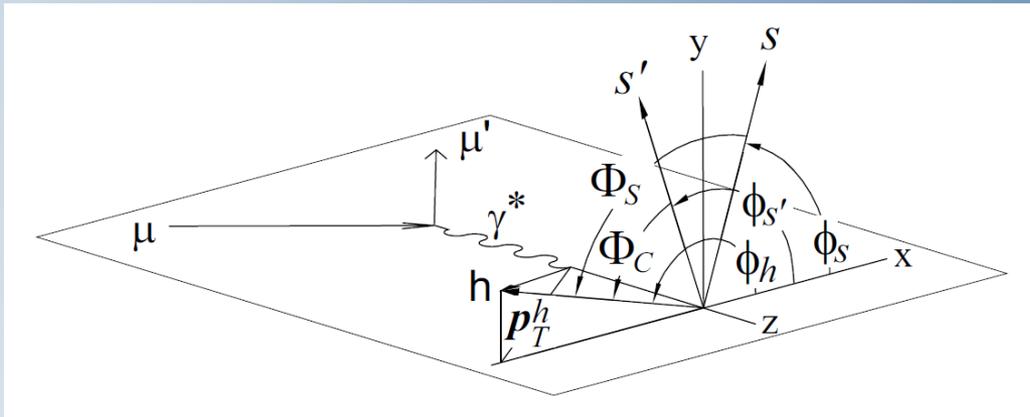
COMPASS
PLB 713 (2012) 10
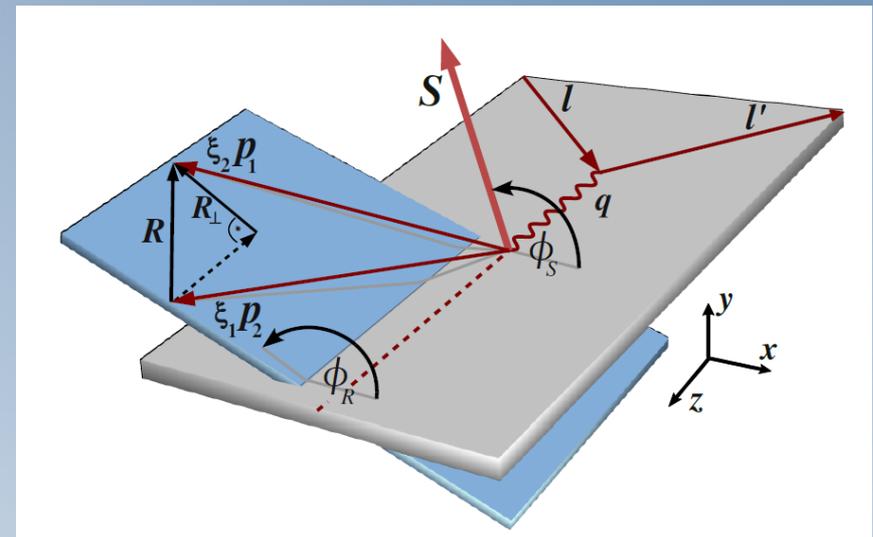
# introduction

**correlations among the "standard" azimuthal angles**



$\phi_{h+}$

$\phi_{h-}$

$\phi_{h+} - \phi_{h-}$
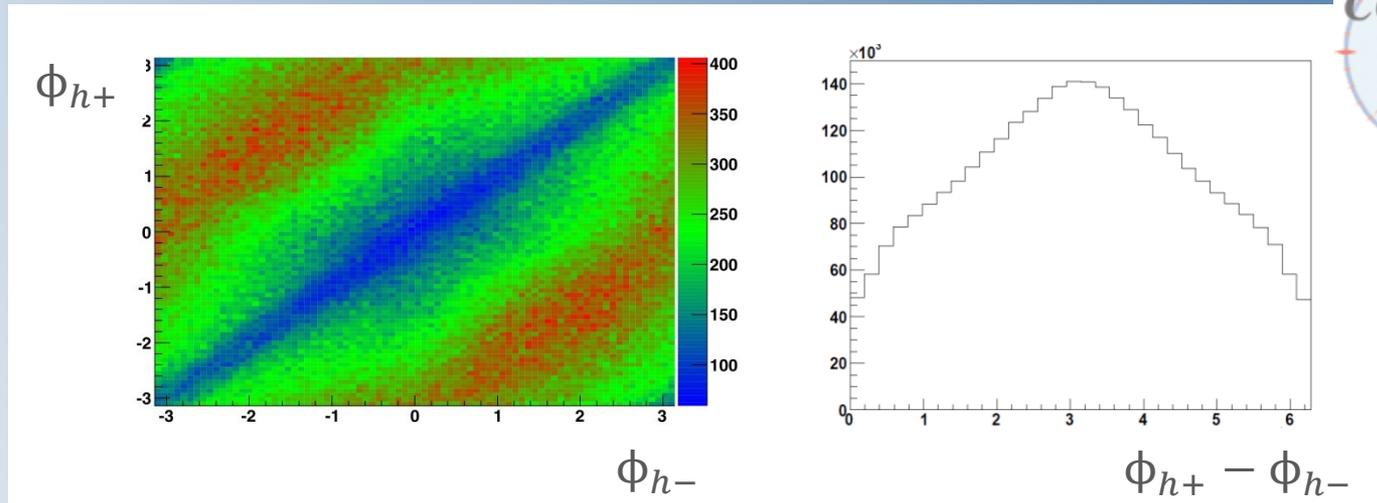
**same with unpolarised Lepto**

# introduction

**correlations among the "standard" azimuthal angles**



$\phi_{h+}$

$\phi_{h-}$

$\phi_{h+} - \phi_{h-}$

$\phi_{h+}$

$\phi_R$

$\phi_{h+} - \phi_R$
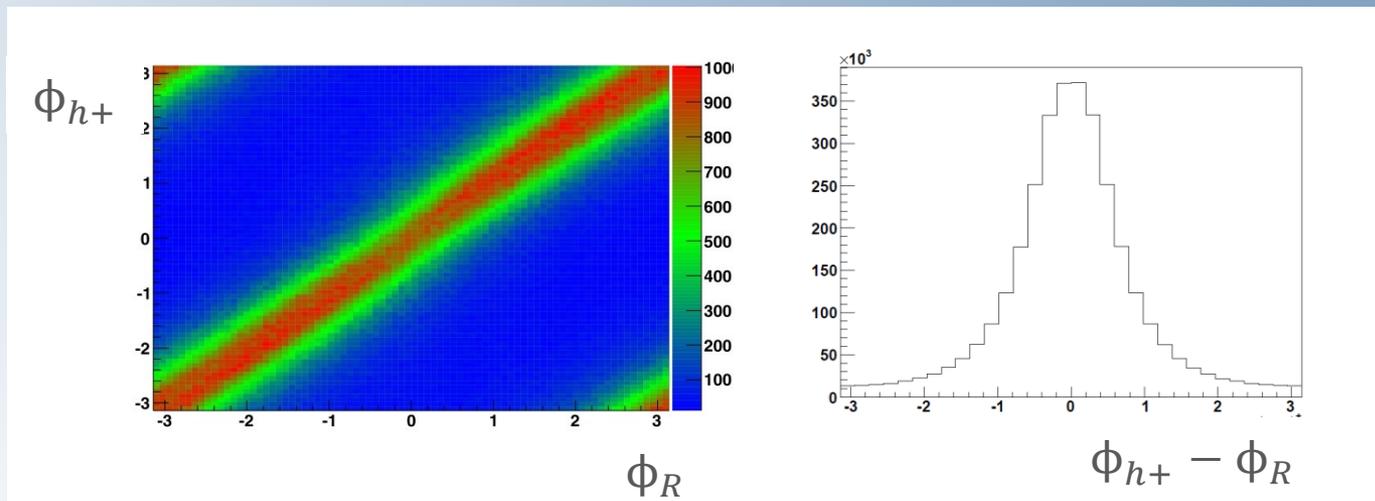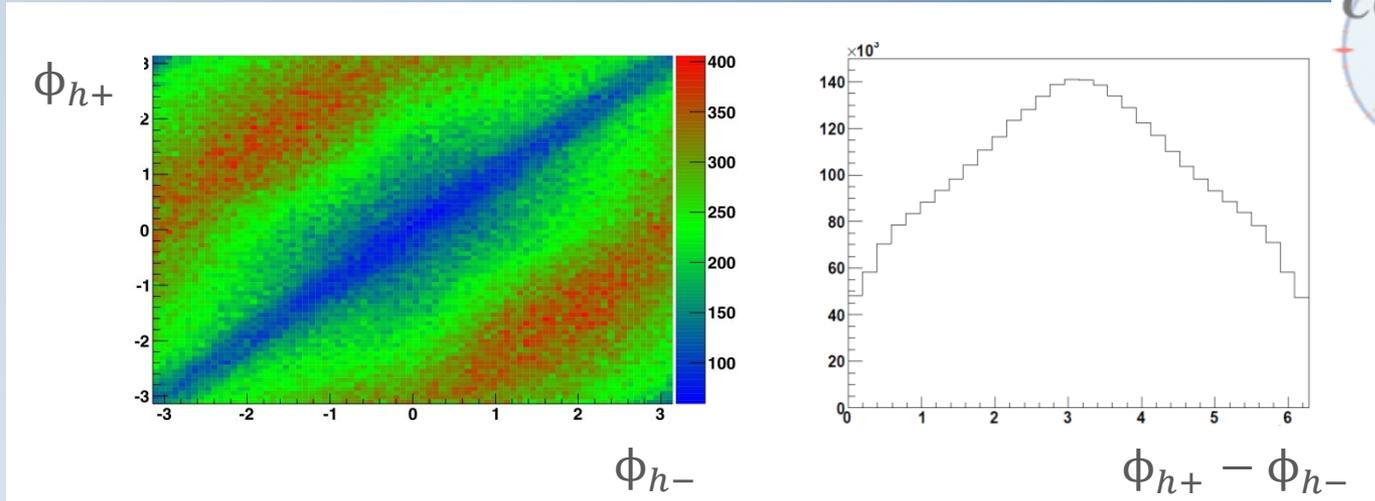
**same with unpolarised Lepto**

# data samples and analysis

**2010 data**

**same data selection and analysis than for published / released results**

**common hadron sample for Collins and 2h analysis, i.e.**

- **events which contain at least one positive hadron and at least one negative hadron**

- **for each event the number of hadrons is the number of h+h− pairs, as defined in the 2h analysis**

- $p^h_T > 0.1$ **GeV/c and** $R_T > 0.07$ **GeV/c**

**two sets of data, with** $z_i > 0.1$ **and** $z_i > 0.2$

# part 1 - results
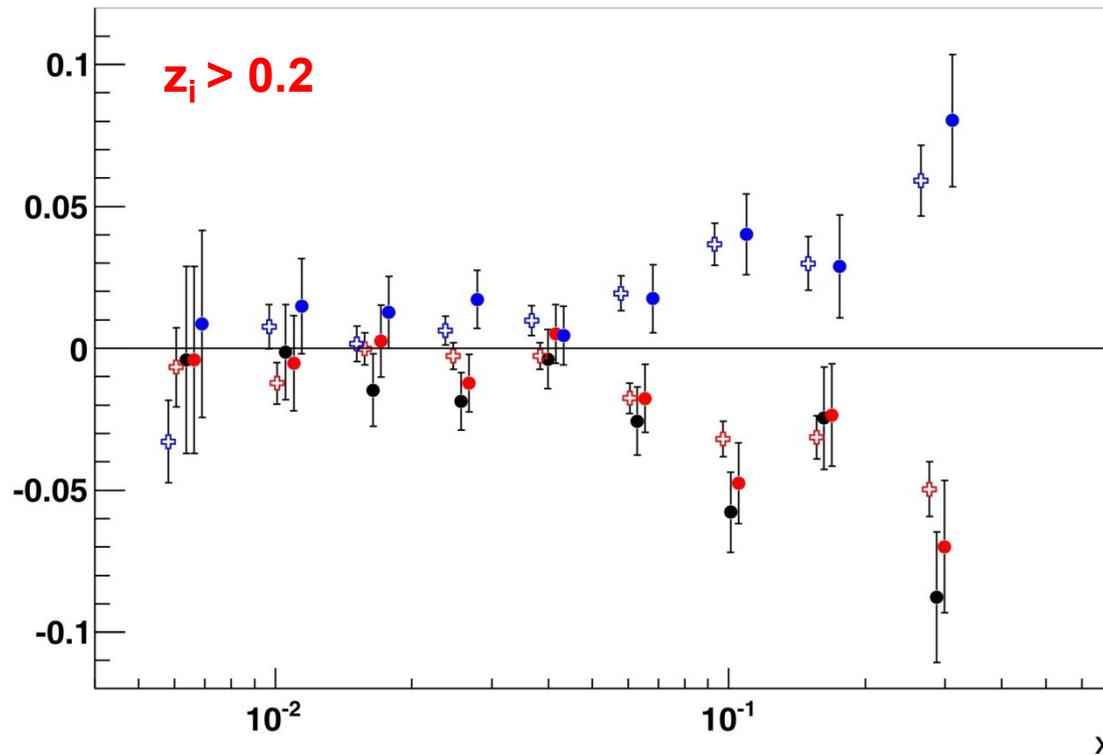
# part 1 - results

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$z_i > 0.1$
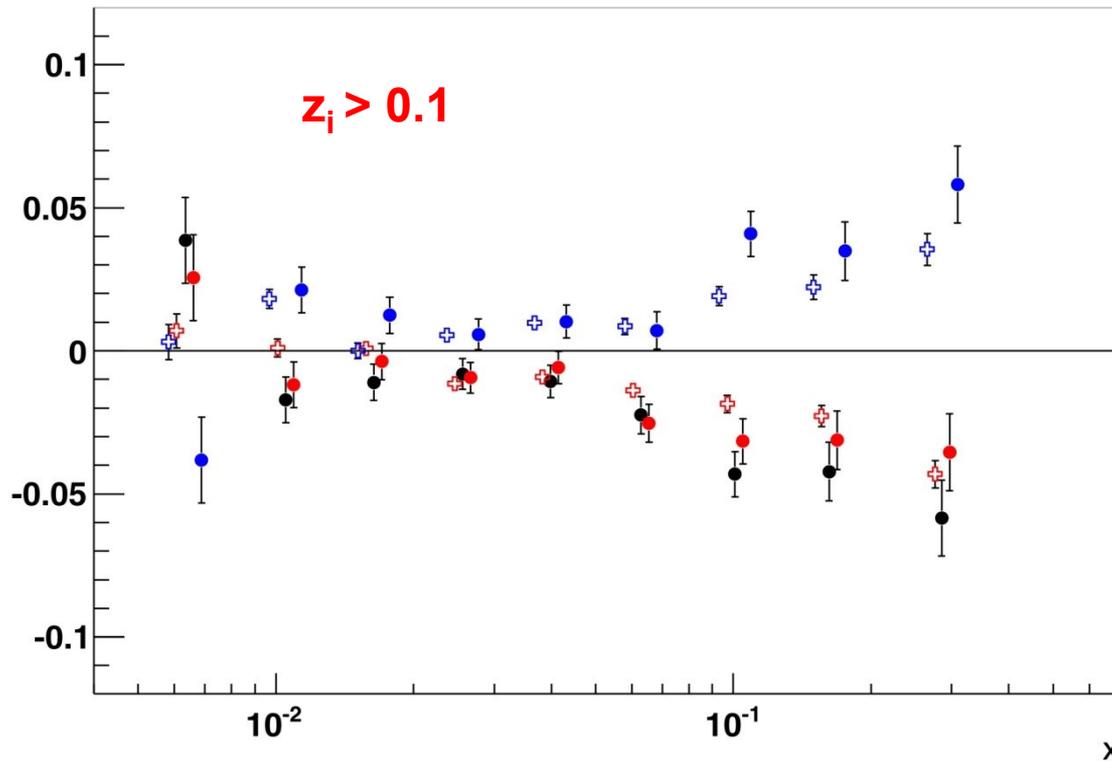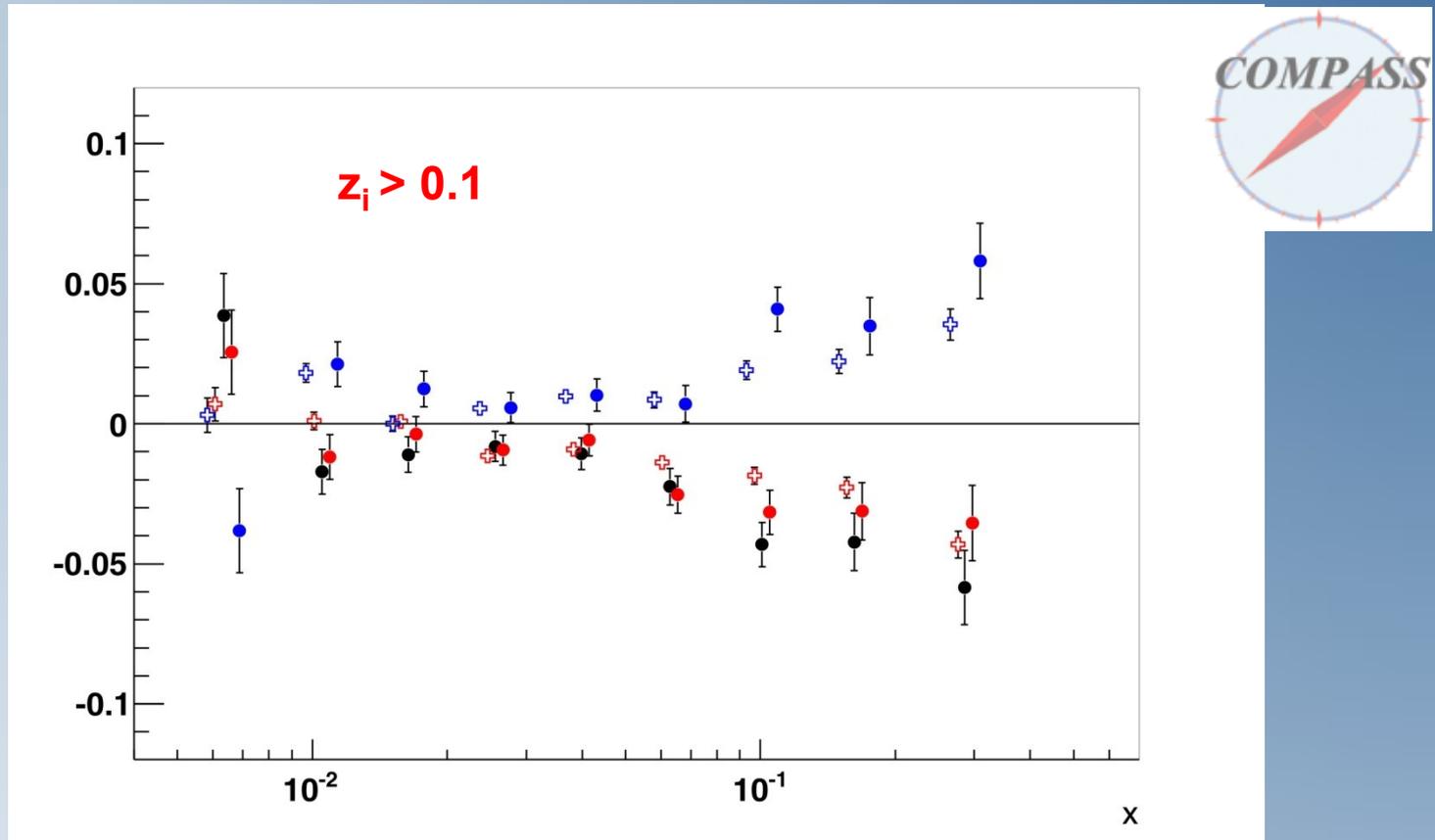
in both cases, the 2h asymmetry is somewhat larger, as expected

from the ratio, information on the relative strength of the analysisng powers

# part 2

## a different definition of the 2h azimuthal angle

For each pair of oppositely charged hadrons

- we evaluate in the GNS the unit vectors $\hat{k}^+$ and $\hat{k}^-$ of their transverse momenta,
- we evaluate the vector $\vec{R}'_T = \hat{k}^+ - \hat{k}^-$,
- we evaluate the azimuthal angle $\phi_{R'}$ of the vector $\vec{R}'_T$.

The angle $\phi_{R'}$ essentially is the arithmetic mean of the azimuthal angles of the two hadrons,

$$\phi_{R'} = \{\phi_{h^+} + [\phi_{h^-} - \pi]\}/2$$

**very simple**
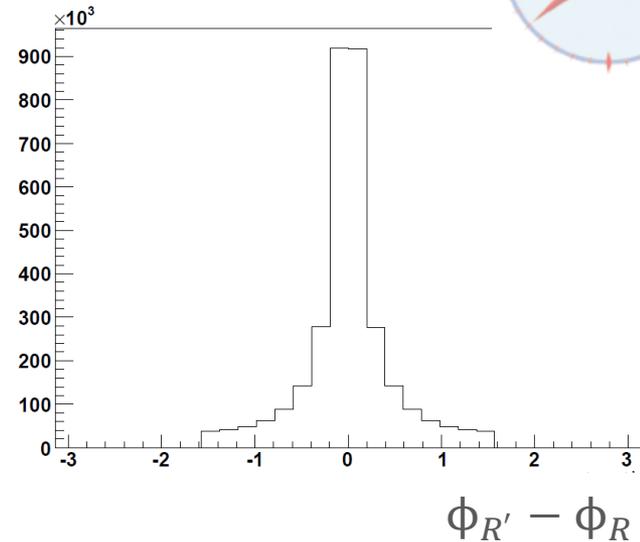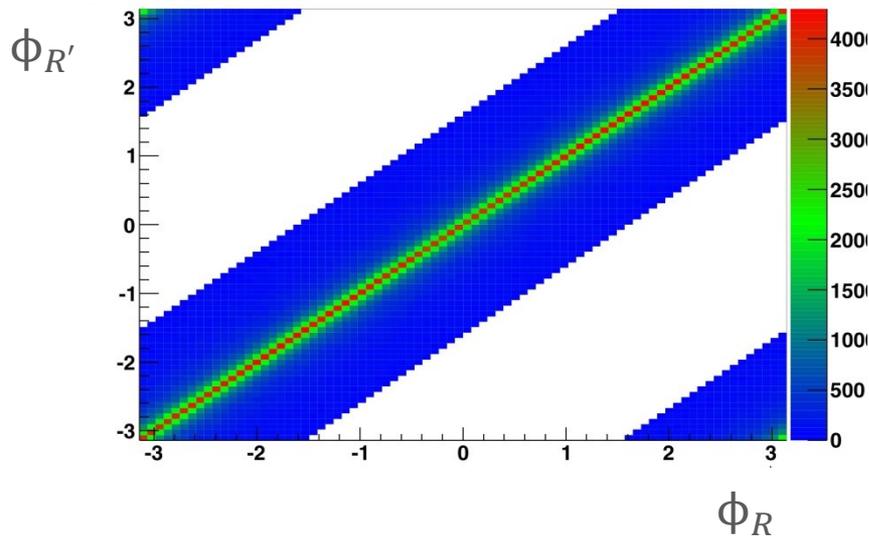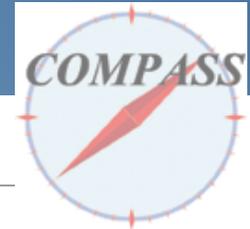
with unpolarised Lepto
same result,
even using vectors and not unit vectors
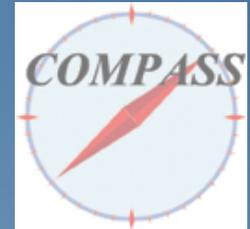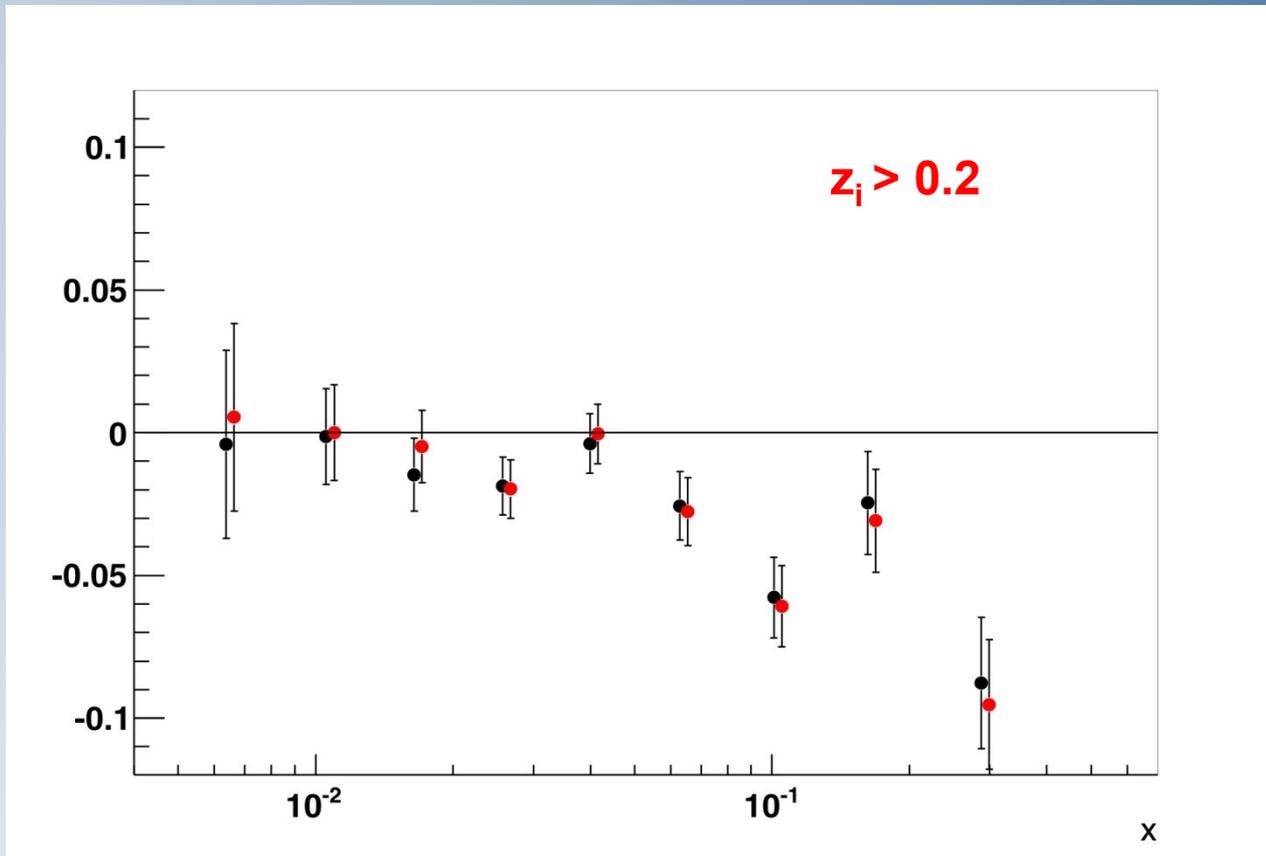
**2h asymmetries using $\phi_{R'}$ and $\phi_R$**
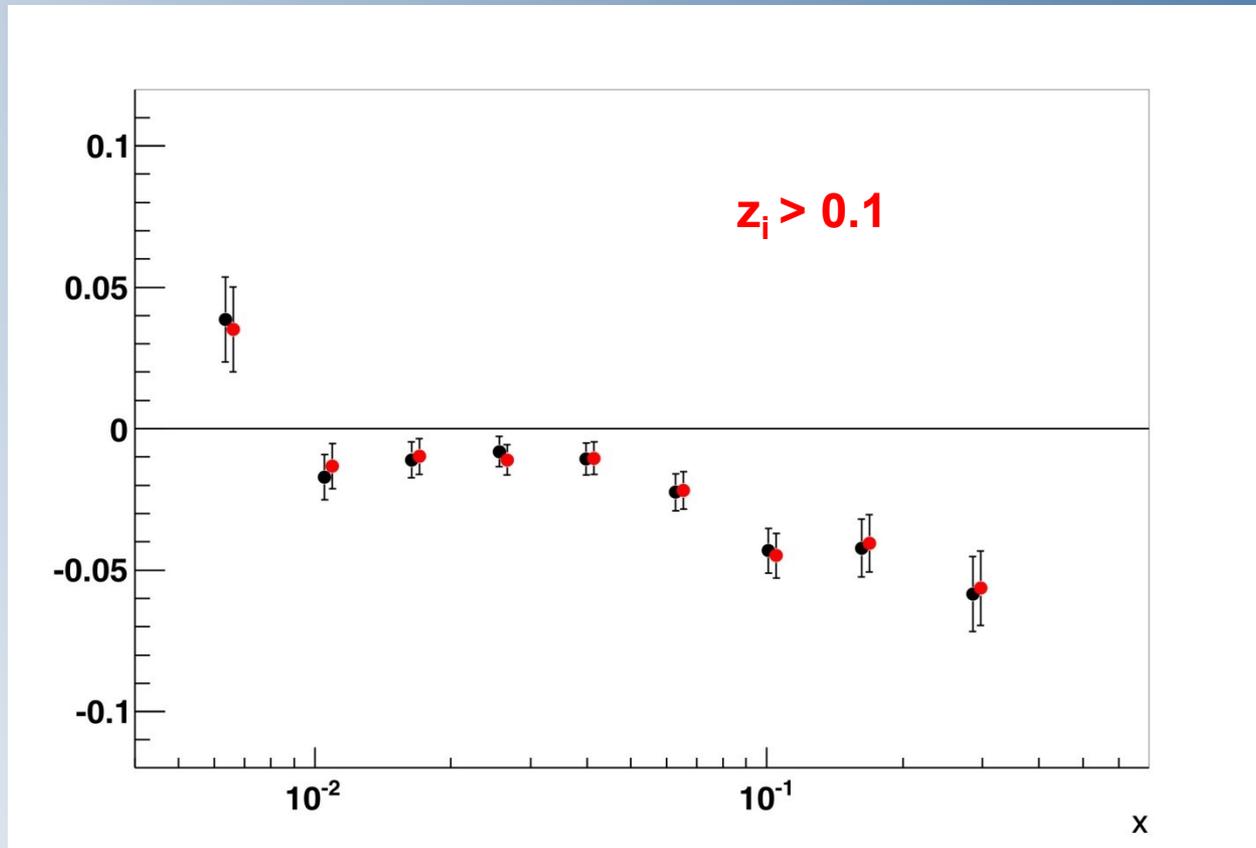
**2h asymmetries using $\phi_{R'}$ and $\phi_R$**

# summary
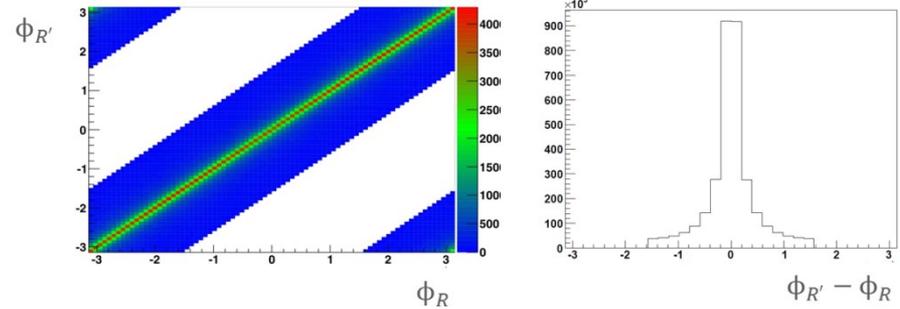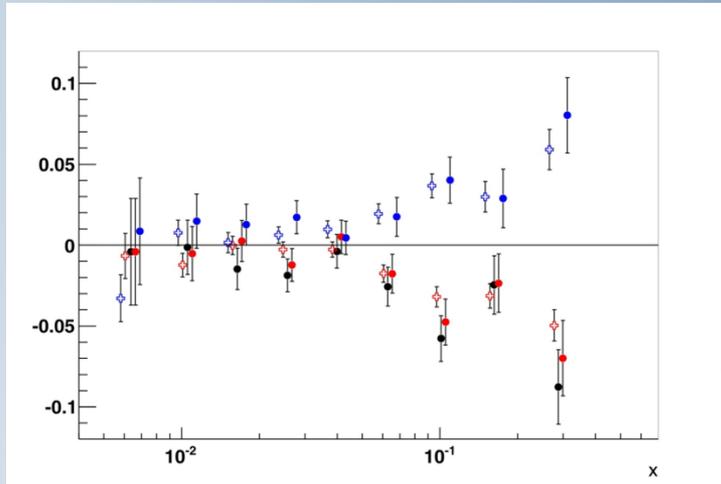


**the asymmetries are very close,
hinting at a common physical origin for the Collins mechanism
and the di-hadron fragmentation function …**