Event generator for TCS using a quasi-real photon beam and a transversally polarized target

Input file of the event generator

- Beam = electron or real photon
- Free parameters in cross sections: range in Eγ, -t, Q'2, θ_{CM}, Φ_{CM}
- With an electron beam: E_e (11 GeV), Q^2max (0.3 GeV^2)
- Electron / real photon beam polarization (-0.8)
- Target polarization: longitudinally or transversally polarized + degree
- Target lenght and nuclei (15 cm LH2)
- N events

Generated events:

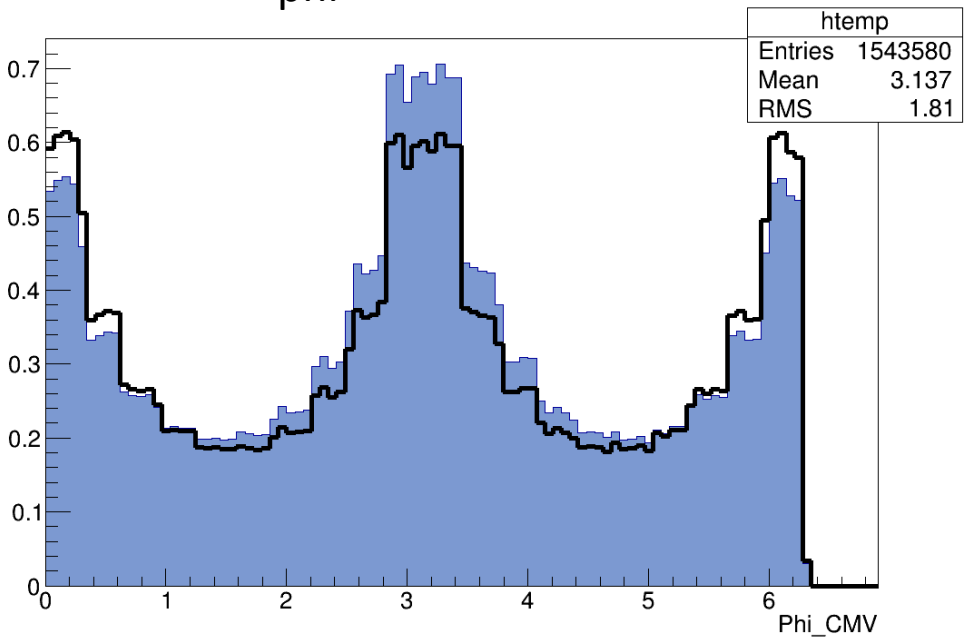
Initial state: e P or γ P
Final state: P e+e- (or μ+μ-) (e')

With an electron beam, 2 kind of events, generated according to the probabilities of:

- Photon comes from interaction with a proton and is quasi-real (Q^2<0.3 GeV^2)
- Photon comes from bremsstrahlung in the target

Angles in virtual photon CM

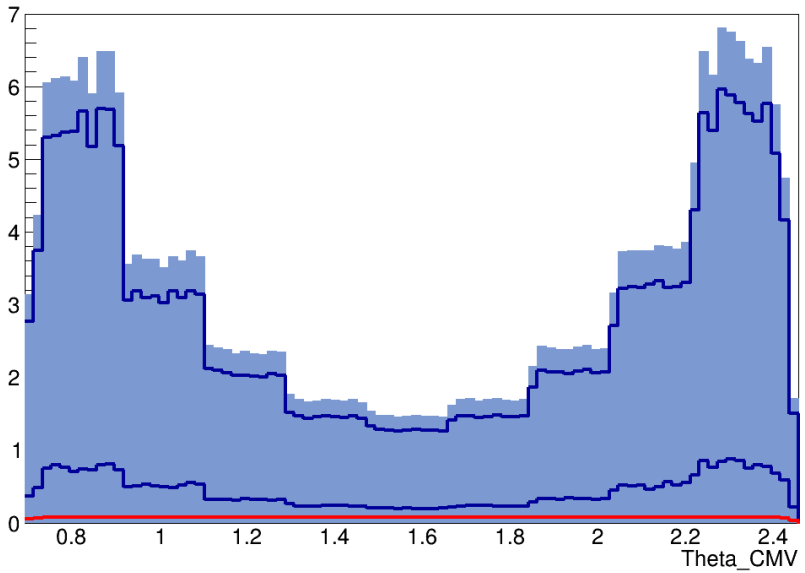
phi



■ All (π -0.2<ϑ<π+0.2)

__ BH contribution

theta



■ All (π -0.2<ϑ<π+0.2)

__ top: event from quasi-real photon, bottom: event from real brm. Photon

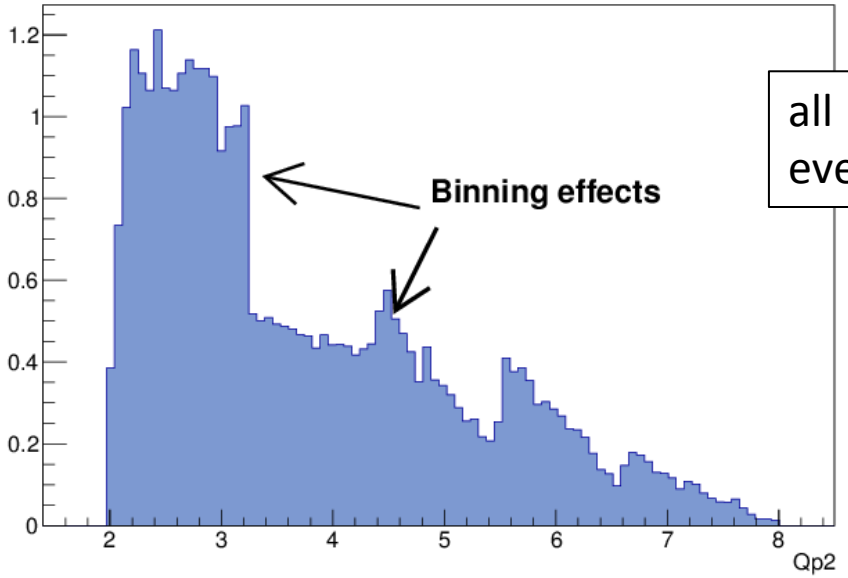
__ TCS contribution

Option in output file: weights for ''BH only'', ''TCS only'', ''BH+TCS''

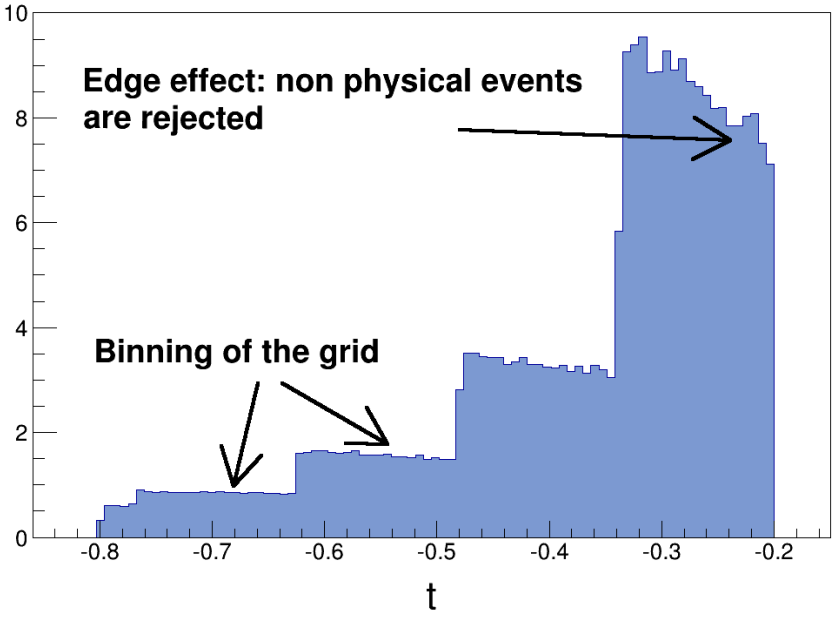
→ compare counting rates to TCS/BH ratio in different bins

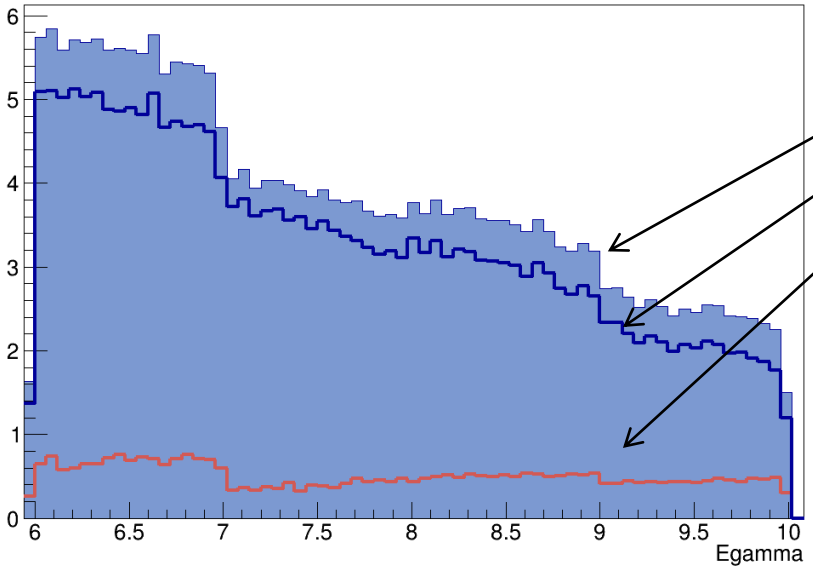
- CM angles are the same for both contributions : as expected
- Follow the form of the theoretical predictions

Kinematics



all events





All
Quasi-real photons contribution
Bremsstrahlung photons
(proba depends on energy → ok)

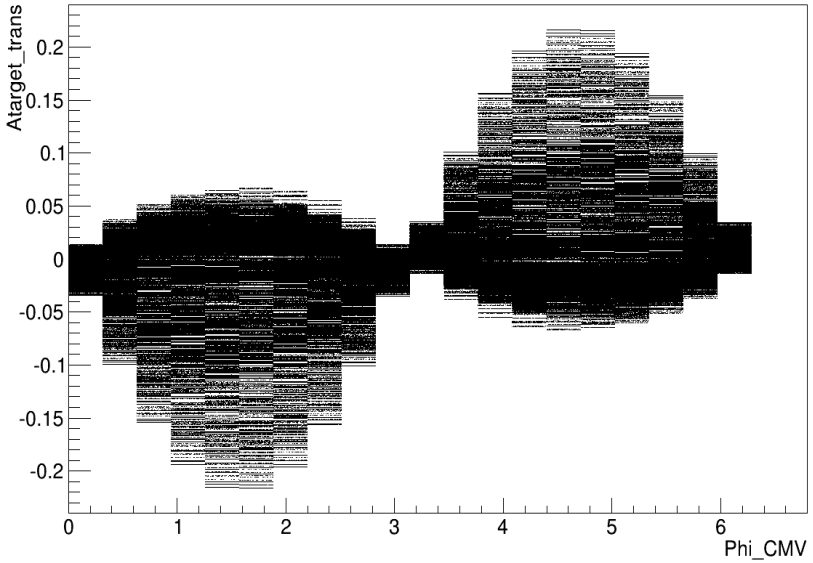
- **Curves follow theoretical predictions**
- **Need a cross section table with thinner bins (still running on calculation grid)**

Transverse Target Spin Asymmetries

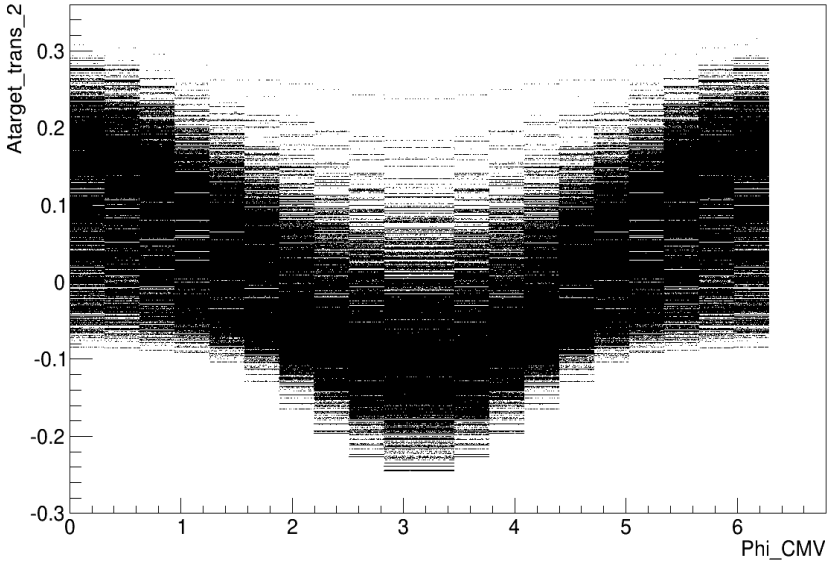
zero for BH → reflects interference TCS+BH

Maximal ''transverse'' asymmetries in the whole generator TCS phase space

TSA in hadronic plane



TSA perpendicular to hadronic plane

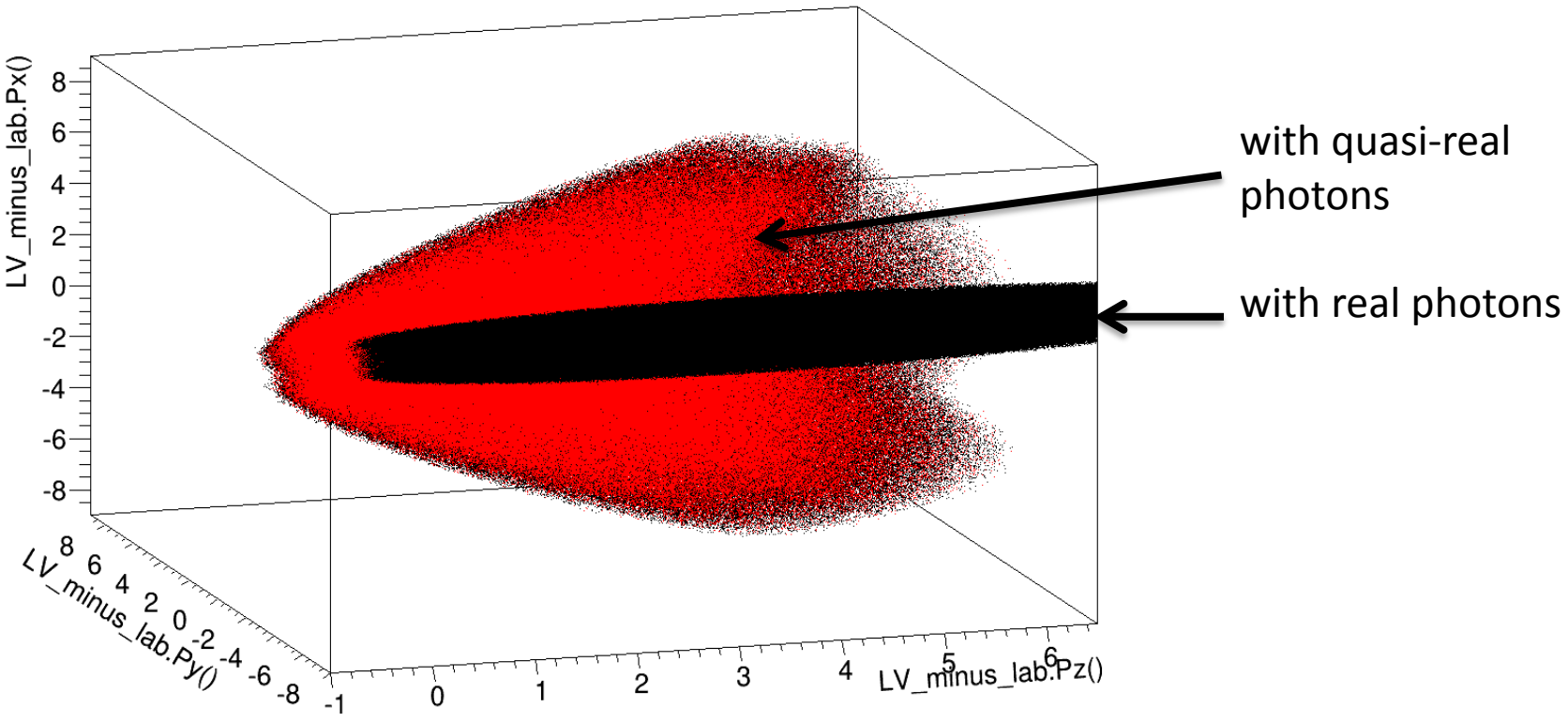


Work in progress:

- compare (checks) cross sections and asymmetries ''weights'' with theorerical calculations
- take account mixing with the longituninal polarization and x,y rotations → ''experimental asymmetry''
- systematic studies: asymmetries vs kinematic, maximal size of bins and comparison to acceptance

Kinematic of outcoming particles

Pair electron momentum: px, py, pz



To do:

- Checks: compare generator predictions with theory (in progress)
- New grid with more bins (is running)
- Check polarizations and polarized cross sections + polarization vectors rotations
- Include polarization rates in asymmetries prediction