Test of DDVCS event generator

- File 1: 2000 events generated in “debug” mode, time ~5 hours (JLab ifarm interactive)
- File 2: 40000 events, time ~0.9 sec/event, total ~11h (JLab ifarm interactive)

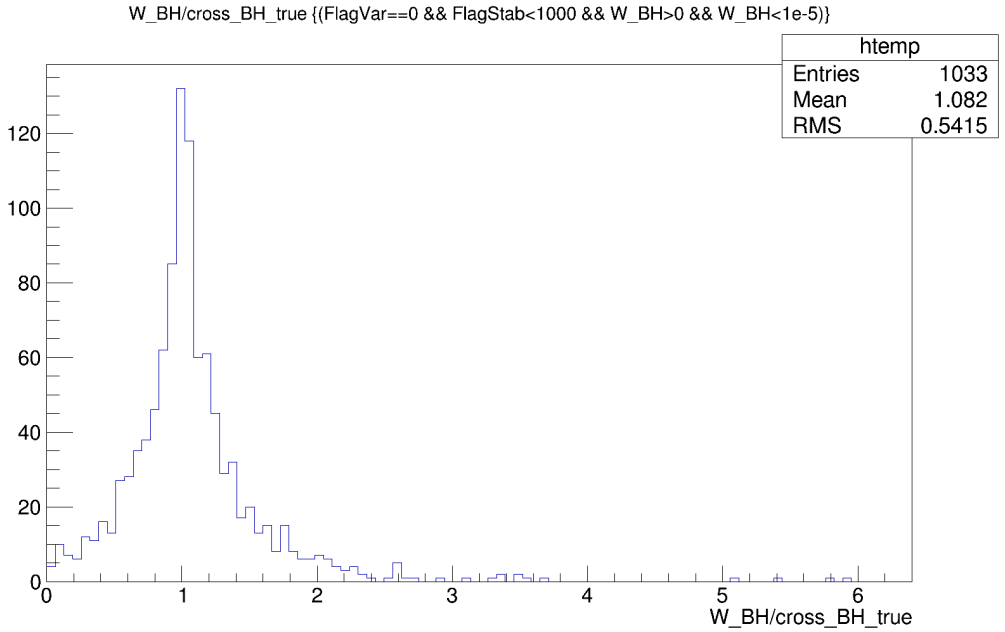
Kinematic:
* E_beam: 11 GeV
* muon pair, proton target
* -t: 0.1 - 0.57 GeV2
* xbj: 0.08 - 0.3
* Q^2: 1.5 - 4 GeV2
* Q'^2: 1.9 - 5 GeV2
* pair polar angle: 45° - 135°
* pair and beam azimuthal angle: 0°, 360°
* cos(theta)_gamma1^gamma2 < 0.999

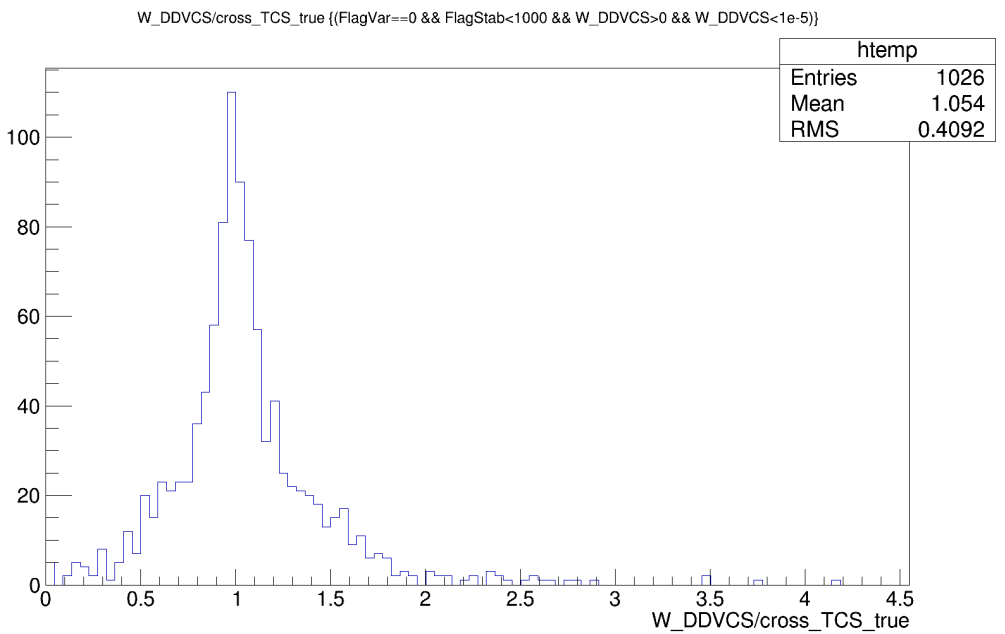
Grid binning:
xbj: 11, -t: 14, Q^2: 14, Q'^2: 14, phi_LH: 15, theta_CM:15, phi_CM: 15

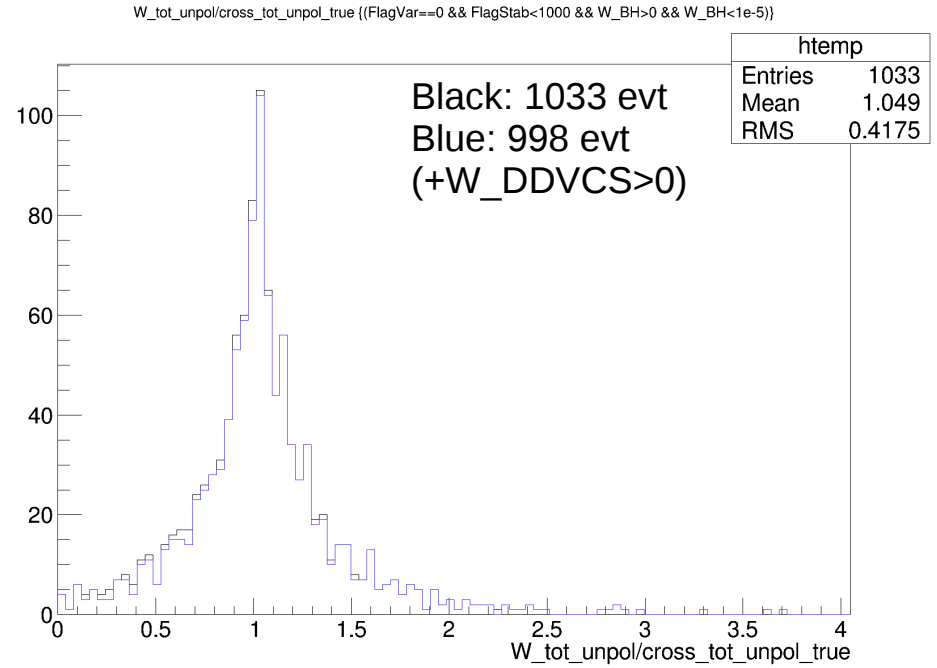
Misc:
* random generation = flat but events out of phase space are rejected
* weights: bh, ddvcs, bh+ddvcs, (asymmetry not checked yet)
* linear interpolation for the weights (49 points averaged)
* flags indicating potential numerical divergences
* weights from grid and weights from executable (debug mode only)

Marie Boër, April 17, 2016

Generator weights vs executable (integrated over the full range)







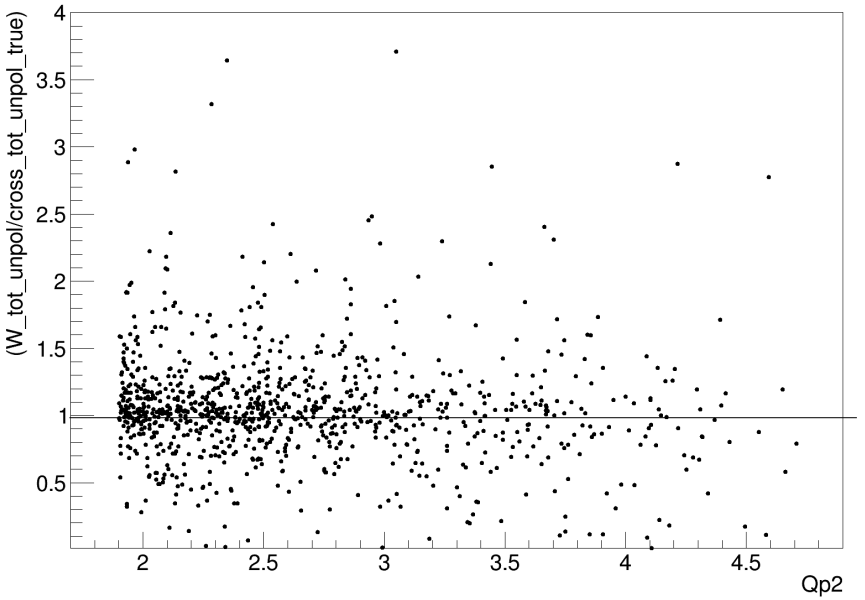
BH+DDVCS fit by a gaussian: mean=1.01, sigma=0.2

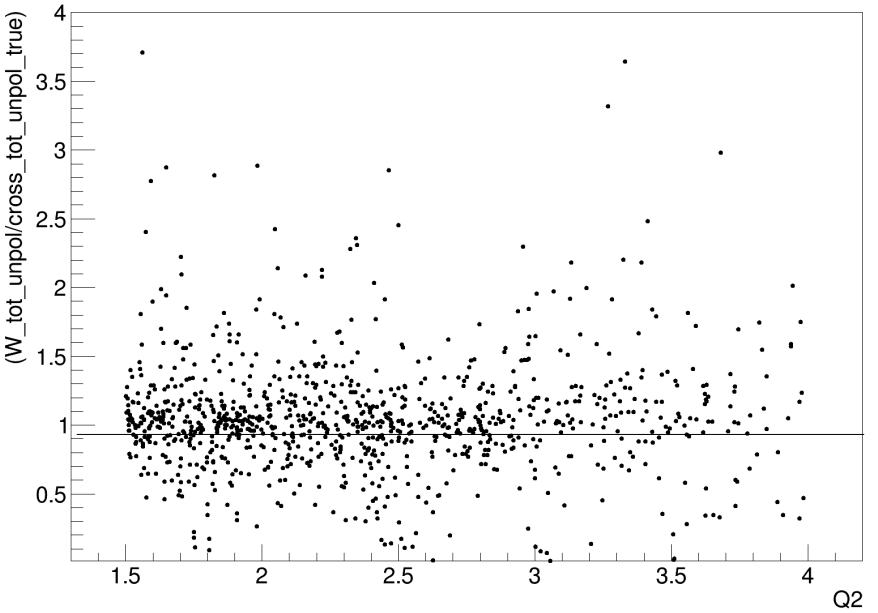
- average weights and distributions are acceptable

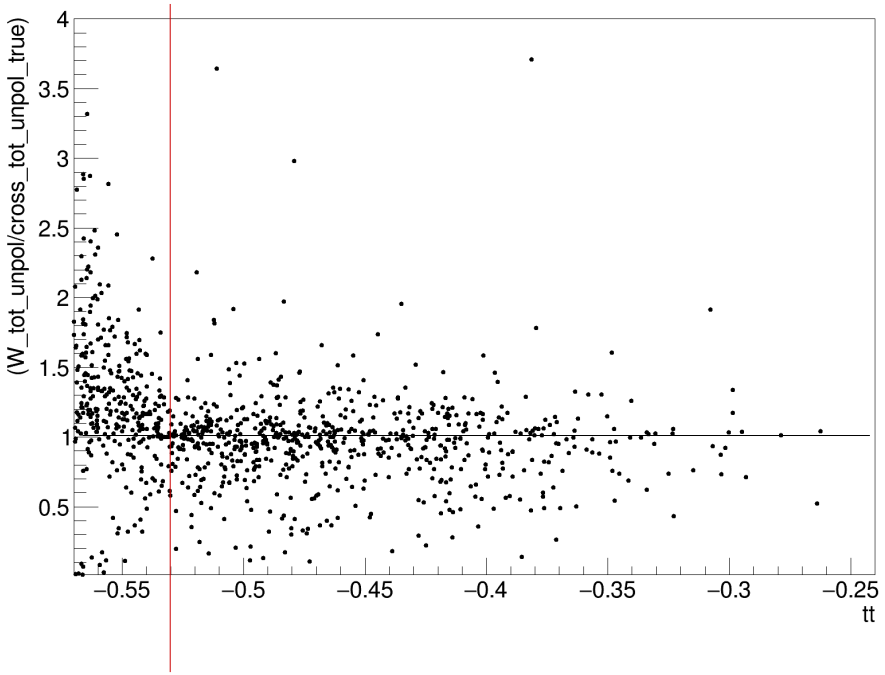
- there are still events a bit far from expected weight, but enough statistic and cuts should smooth this effect

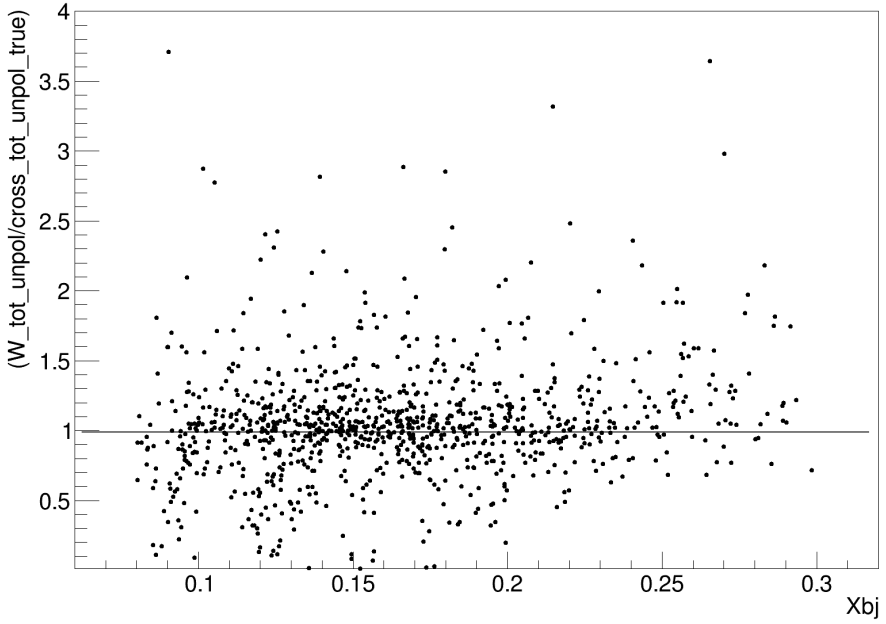
- kinematic cuts and acceptance will help in rejecting events with wrong weights

Uncertainties vs kinematic



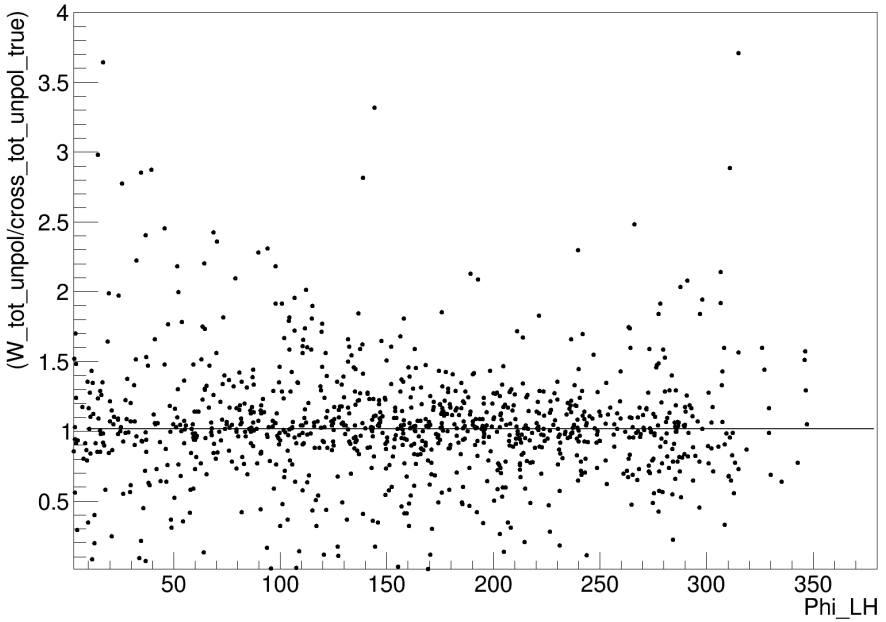


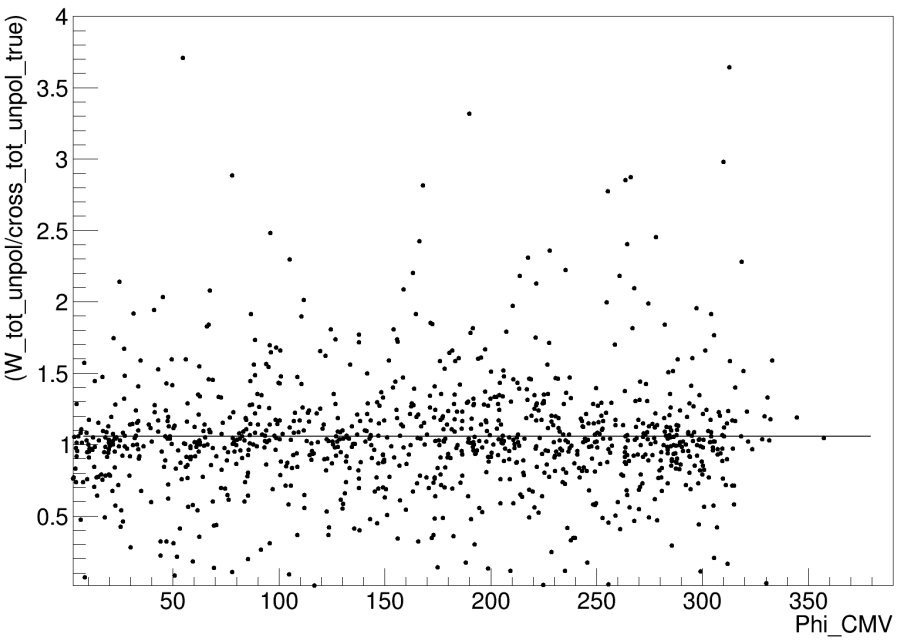




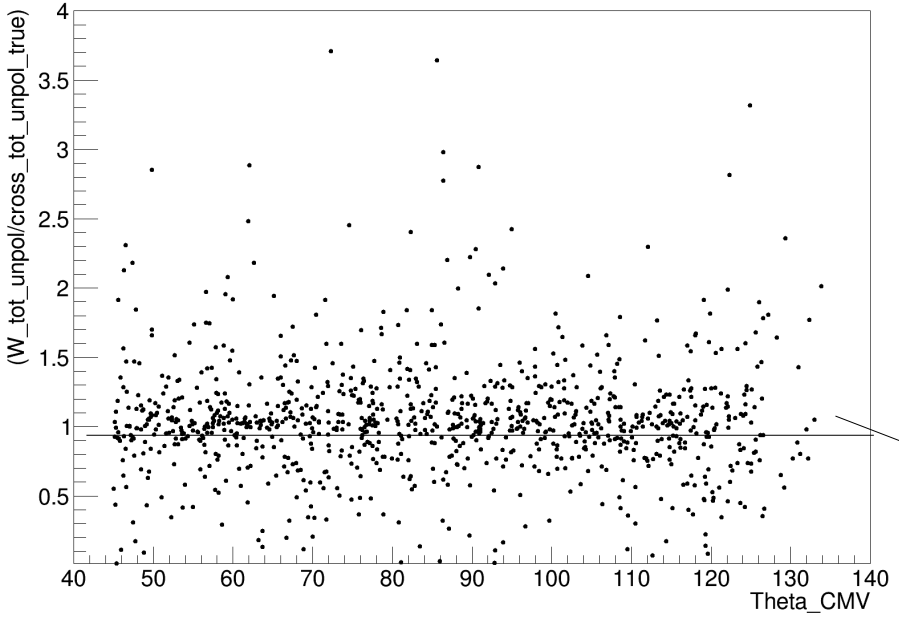
No visible kinematic dependence, except large t. Proposed solution: limit -t=.53 GeV2

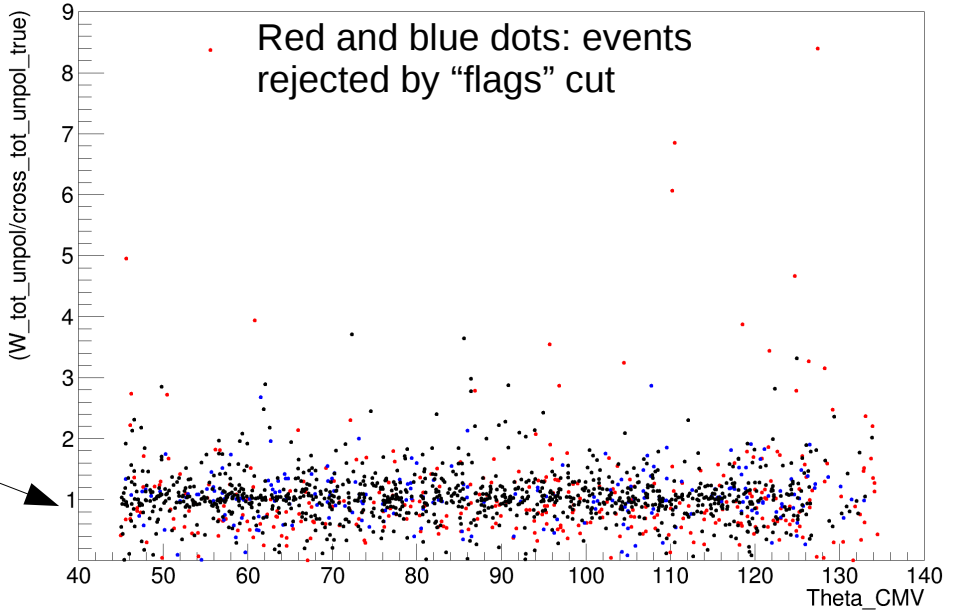
Uncertainties vs kinematic II





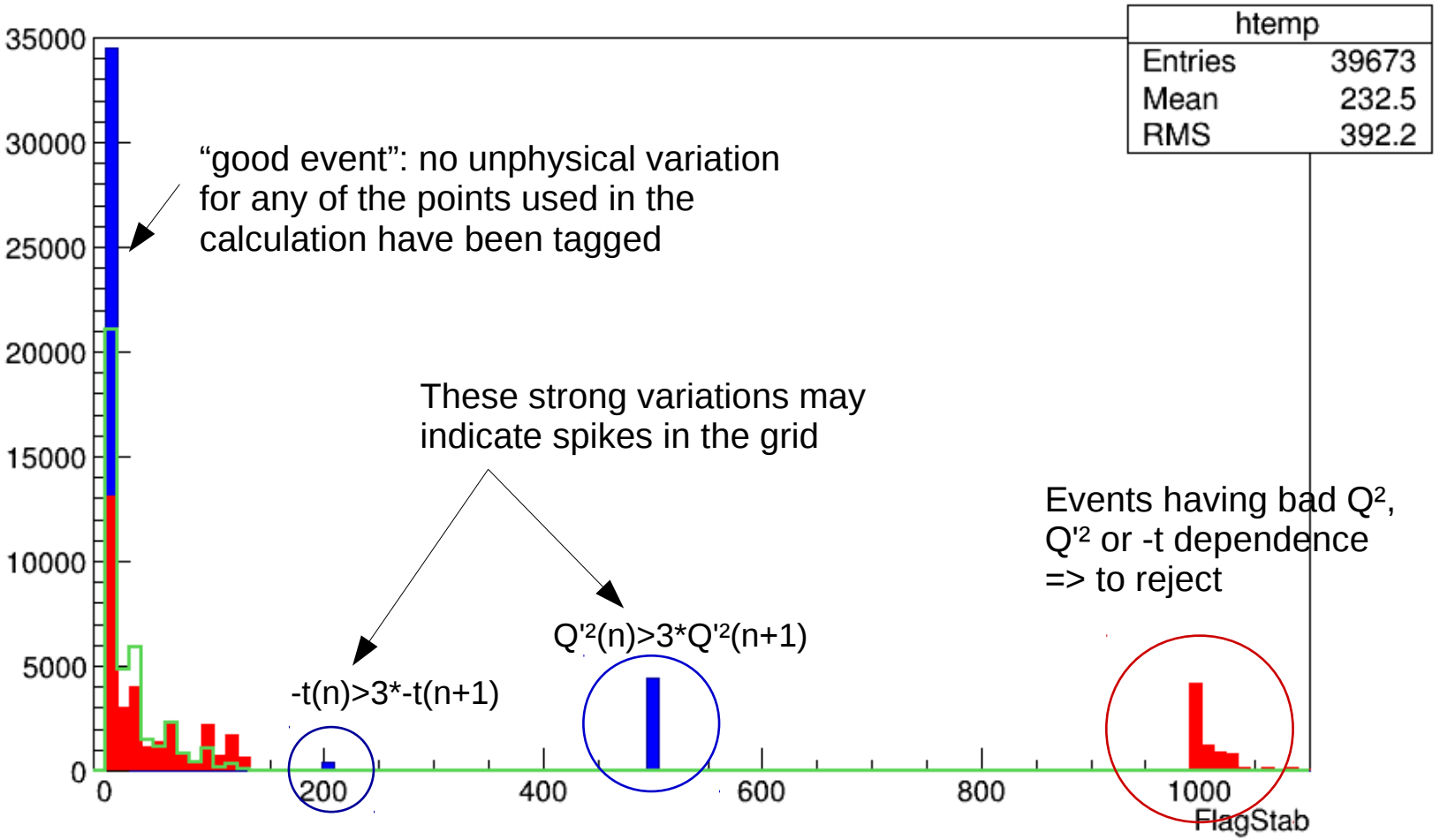
(W_tot_unpol/cross_tot_unpol_true):Theta_CMV {(FlagVar==0 && FlagStab<1000 && W_BH>0 && W_BH<1e-5 && W_DDVCS>0 && W_DDVCS<1e-5)}





- kinematic dependences < uncertainties
- no events for some angle values: rejected while calculating the grid

Flags to track unphysical variations of cross sections



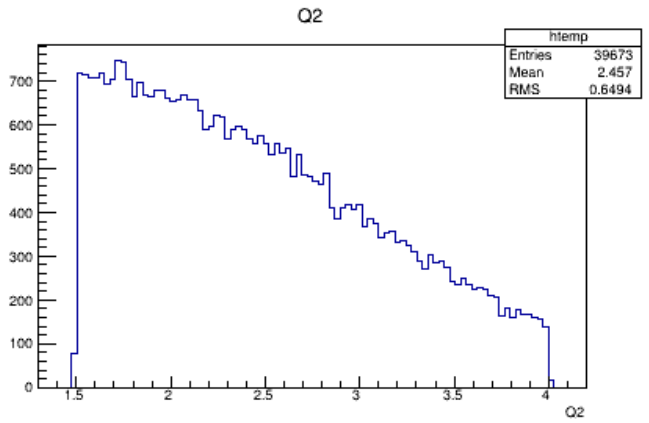
FlagVar (possible spikes)
if x-sec bin n+1/ bin n > 3
+500: in Q'²
+200: in -t
+100: in Q²
+50: in Xbj
+5: in theta_CM
+2: in phi_CM
+1: in phi_LH

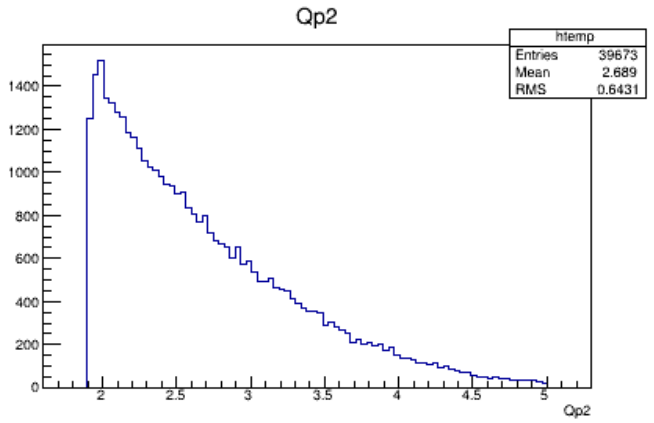
FlagStab: (numerical divergences)
- for each of the 49 points used to average x-sec: +1 if bad Q'² dependence when calculating the grid (at some specific angles) (total=4*49 points)
- If Q², Q'², -t distributions start to increase for bin n+1: +1000

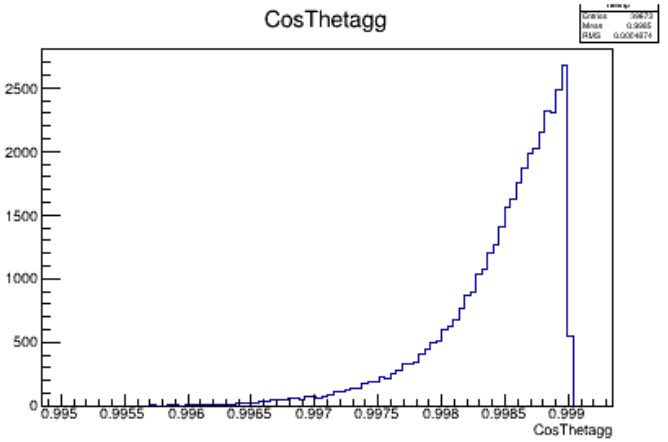
FlagEdge (indicative, edges of physical distribution, depend on grid binning)
+1 if one of the point is out of phase space

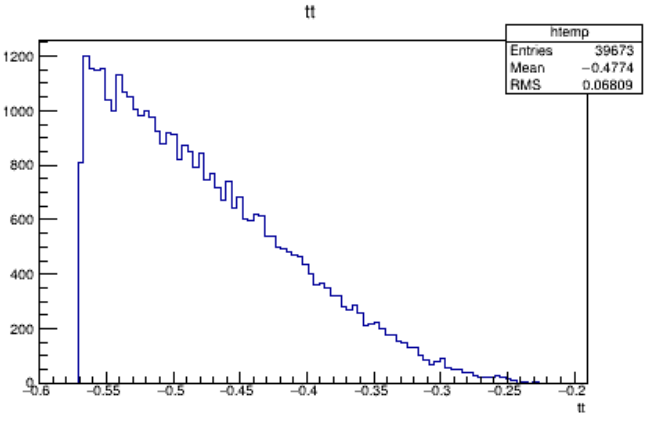
Recommanded: FlagVar=0 and FlagStab=<10. FlagEdge is indicative, it should not be used for cuts, but it may indicate larger uncertainties on x-sec for high FlagEdge.

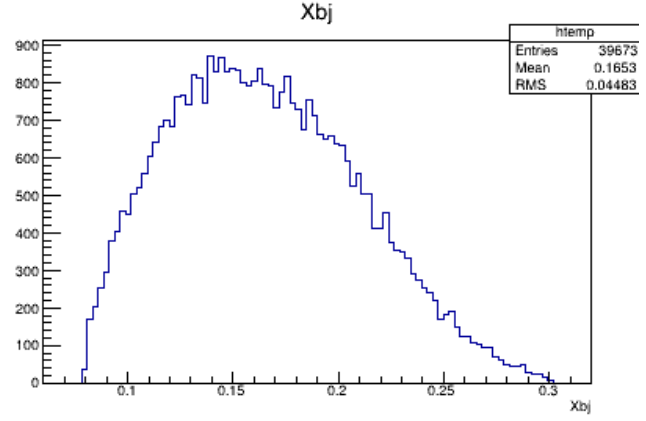
Generated unweighted distributions => generated flat, but events are recorded only if kinematic is allowed

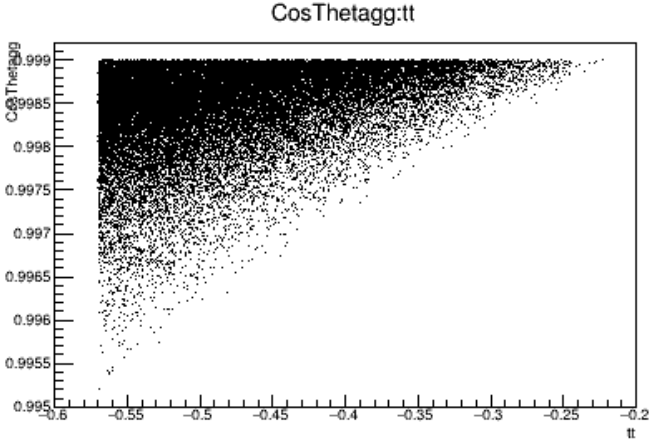


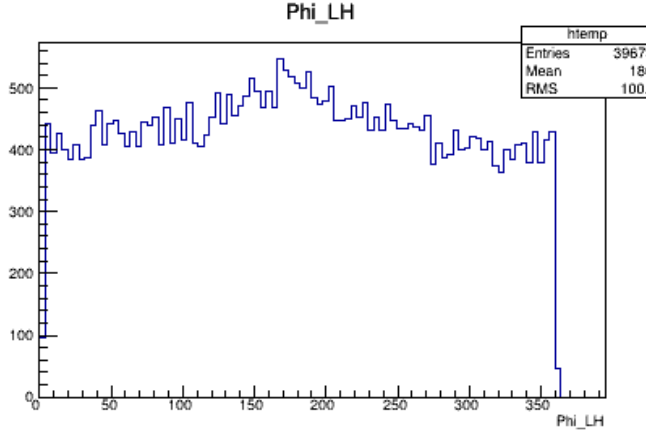


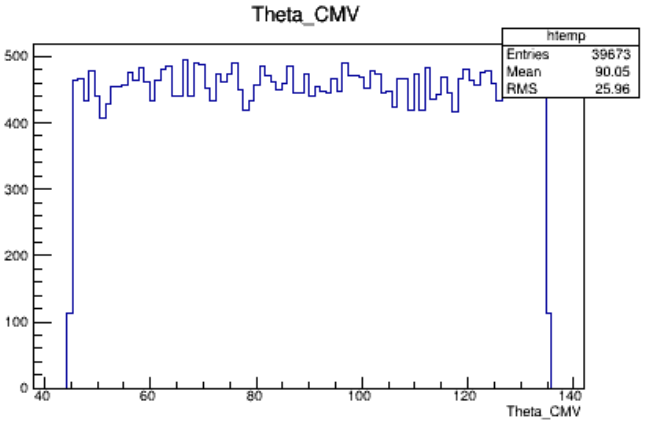


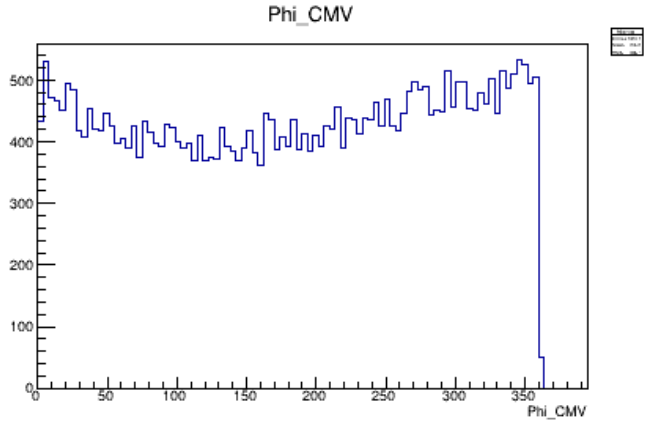












¤ Distributions in kinematic variables, weighted:

- to come with more statistic in the file to check if there are some important binning effects or any spike in the distributions: looks correct at first order, no spikes

Remark:
- lot of events rejected around theta~130° or phi_CM~355° or phi_LH~355°
=> but they should be out of acceptance (?) I will check why.

¤ CONCLUSION:

- few additional checks I plan to do this week

- generator can be used already assuming ~30% uncertainty on weights (very conservative), less if “extrem” angles are considered out of acceptance and cut -t<.53 GeV²

- jobs run interactively on ifarm 1 by 1, I will run on the farm