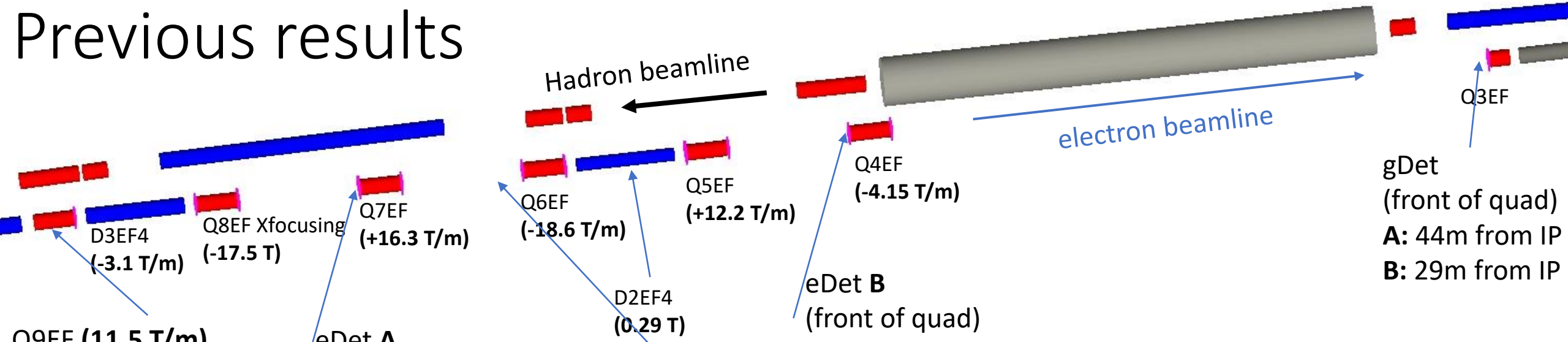
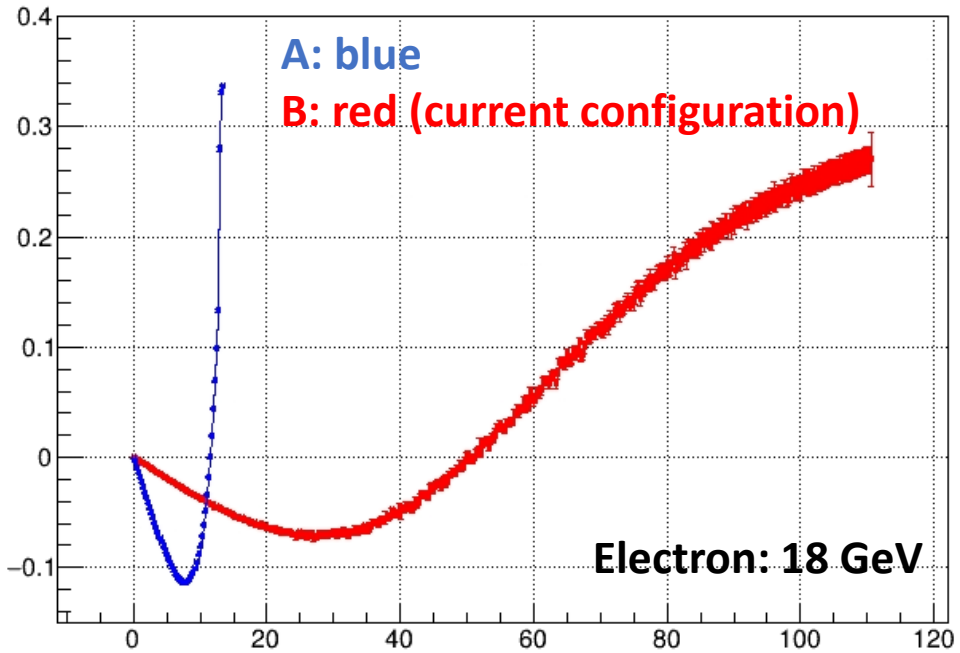
Compton polarimetry at IP6

Ciprian Gal

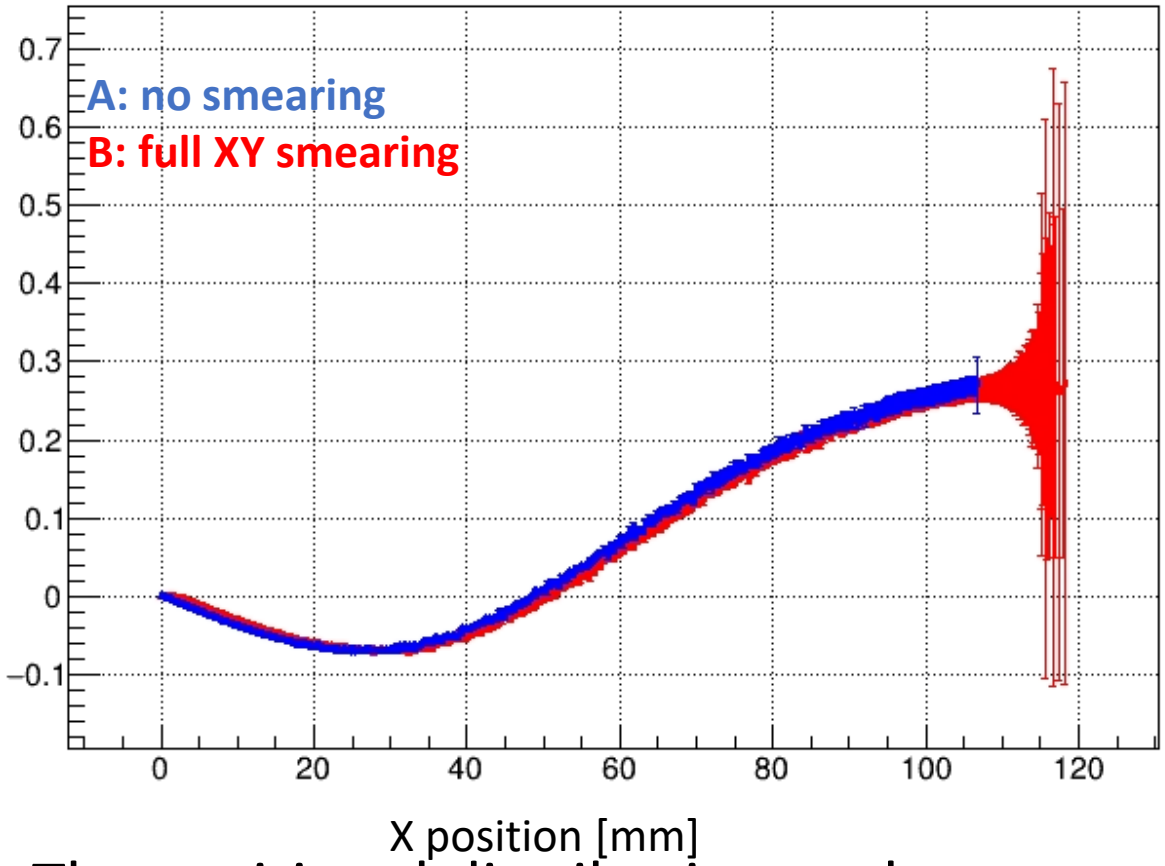
Previous results



- The decision to place the IP location in front of Q6 was based on the comparison of the scattered electron signal (bottom plot on the right) where we saw that the US location produced a very distorted signal that was very close to the beam

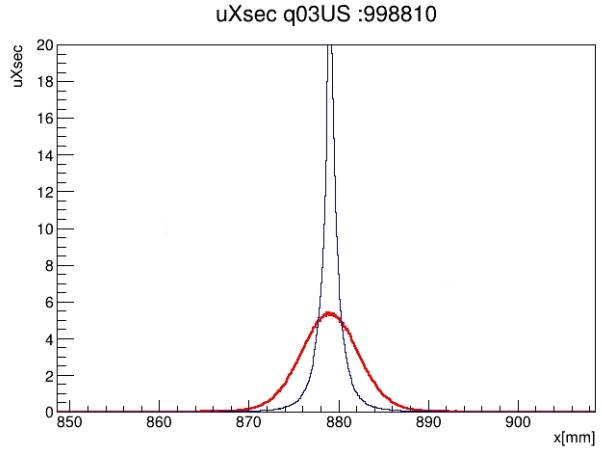


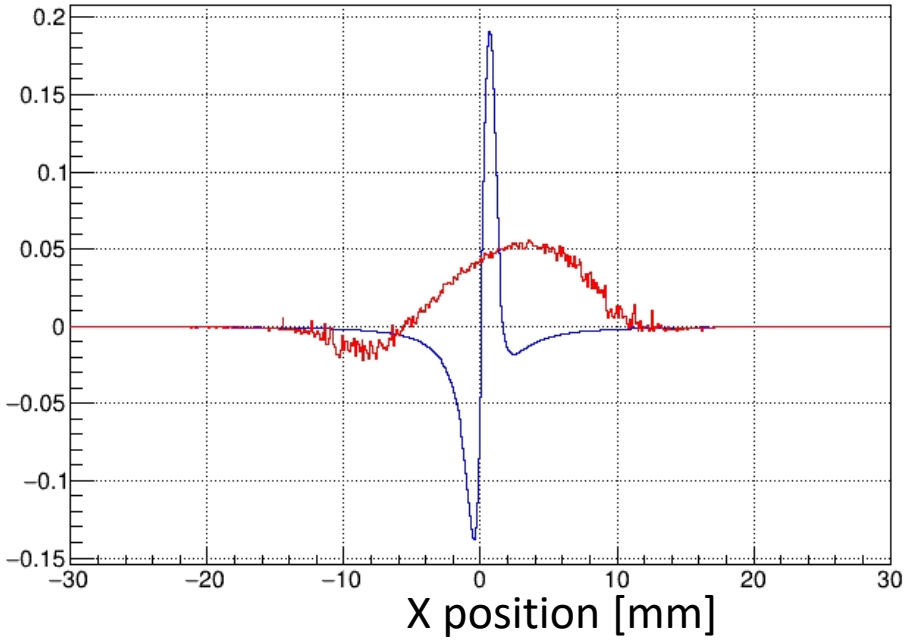
Previous results



- The positional distribution at the electron detector and the asymmetry see a very small effect due to the smearing as expected

- The distribution at the photon detector sees some significant broadening



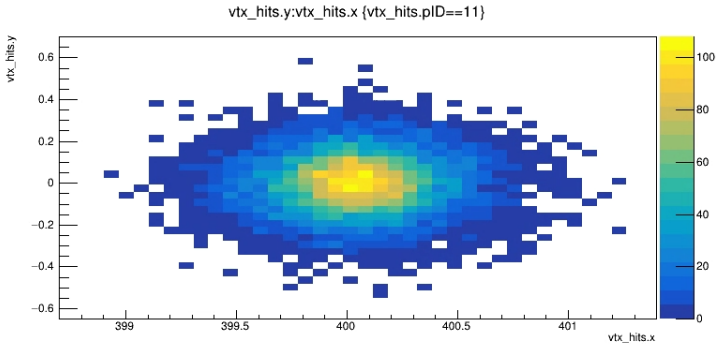


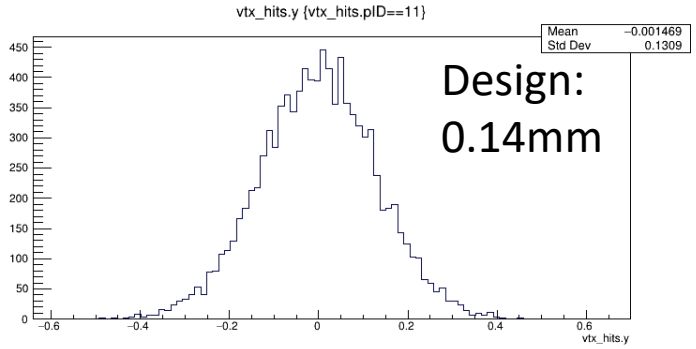
- The transverse asymmetry sees a suppression by a factor of 4 making the measurement more challenging that it already was

Transverse beam smearing

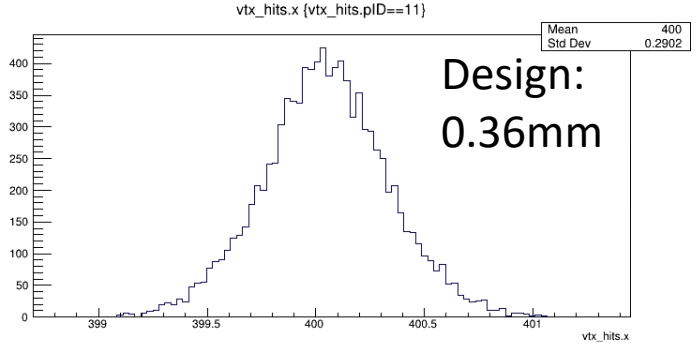
```
/EPol/input/vertexPosX 0.3985 m
/EPol/input/vertexPosY 0 cm
/EPol/input/vertexPosZ 73.4 m
/EPol/input/vertexRotY -0.01527 rad

##high divergence
/EPol/input/beamEmmX 24 nm
/EPol/input/beamEmmY  2 nm
##high acceptance
#/EPol/input/beamEmmX 24 nm
#/EPol/input/beamEmmY  1.2 nm

/EPol/input/laserXYwidth 0.1 mm
/EPol/input/vertexBetaX 5.39 m
/EPol/input/vertexAlphaX -1.45
/EPol/input/vertexBetaY 10.1 m
/EPol/input/vertexAlphaY  2.42
```

Beam sampling





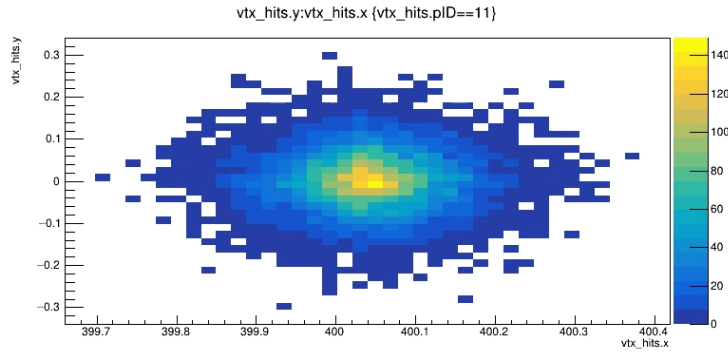
Design: 0.14mm

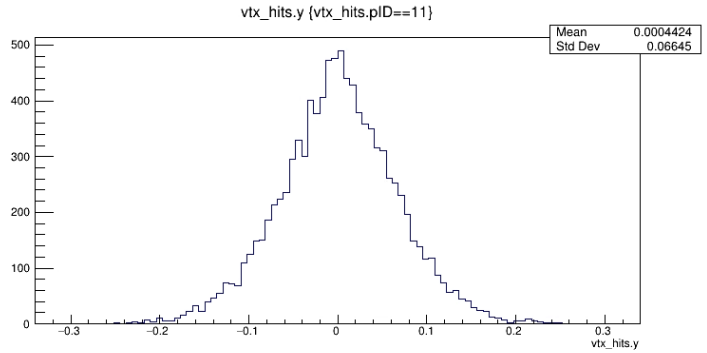


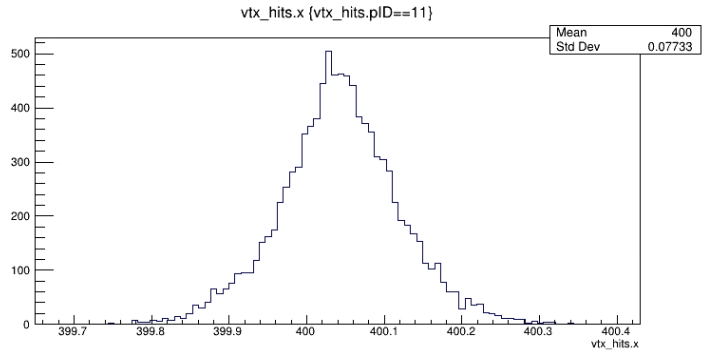
Design: 0.36mm

- Using the start position at the midpoint between Q7 and Q6 (code available at https://github.com/cipriangal/comptonEic/)
- The beam sampling (without taking into account the laser size) on the left has the correct size at the “vertex”
- Putting in the constraint that the vertex needs to be within the laser envelop significantly reduces the phase space (on the right)

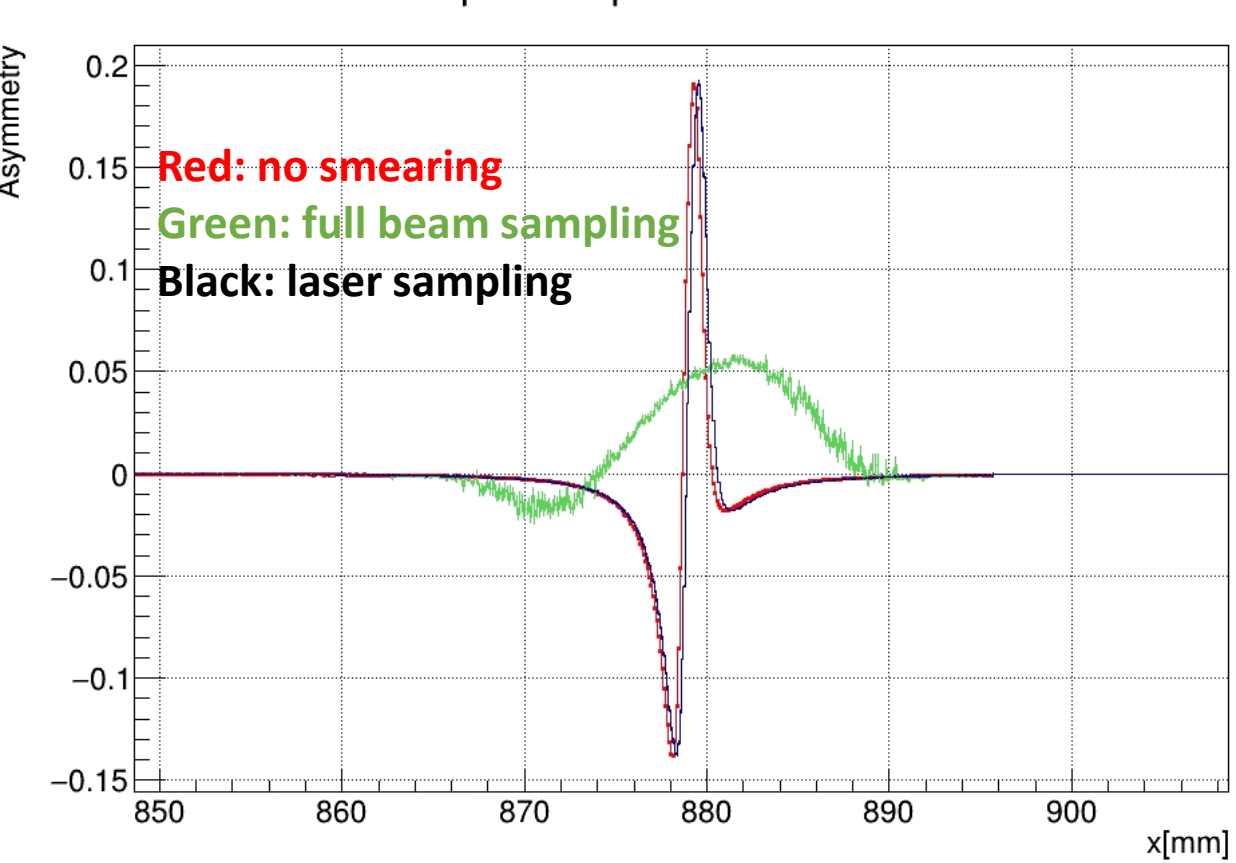
Laser width 0.1mm

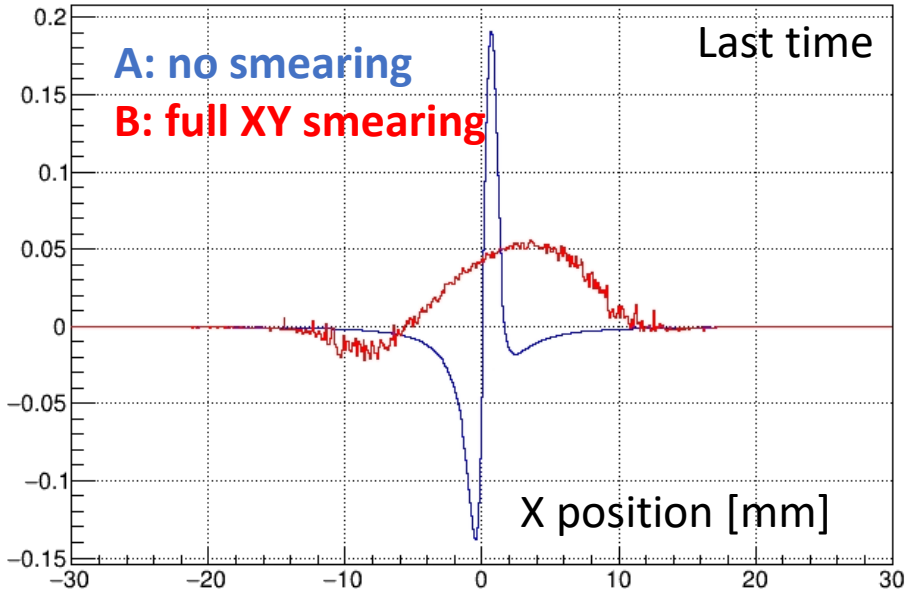






Transverse beam smearing





- When sampling from the entire beam envelope with the correct x, xp, y, yp correlation (green) shows that the first order estimation I did last time was accurate enough
- Restricting the sampling to only the laser width recovers the original analyzing power shape (shift is due to repositioning of the interaction vertex to the mid-point between the quads)

Conclusions

- Sampling from the laser width alone allows us to recover the analyzing powers we had seen directly from the generator
- The beam SR should be evaluated starting further US to check whether the e-det will be affected
  - The photon detector should be able to suppress most of the SR using a pre-radiator, however the power deposition should be calculated once we know the detector geometry
- Study should be repeated for 5 and 12 GeV