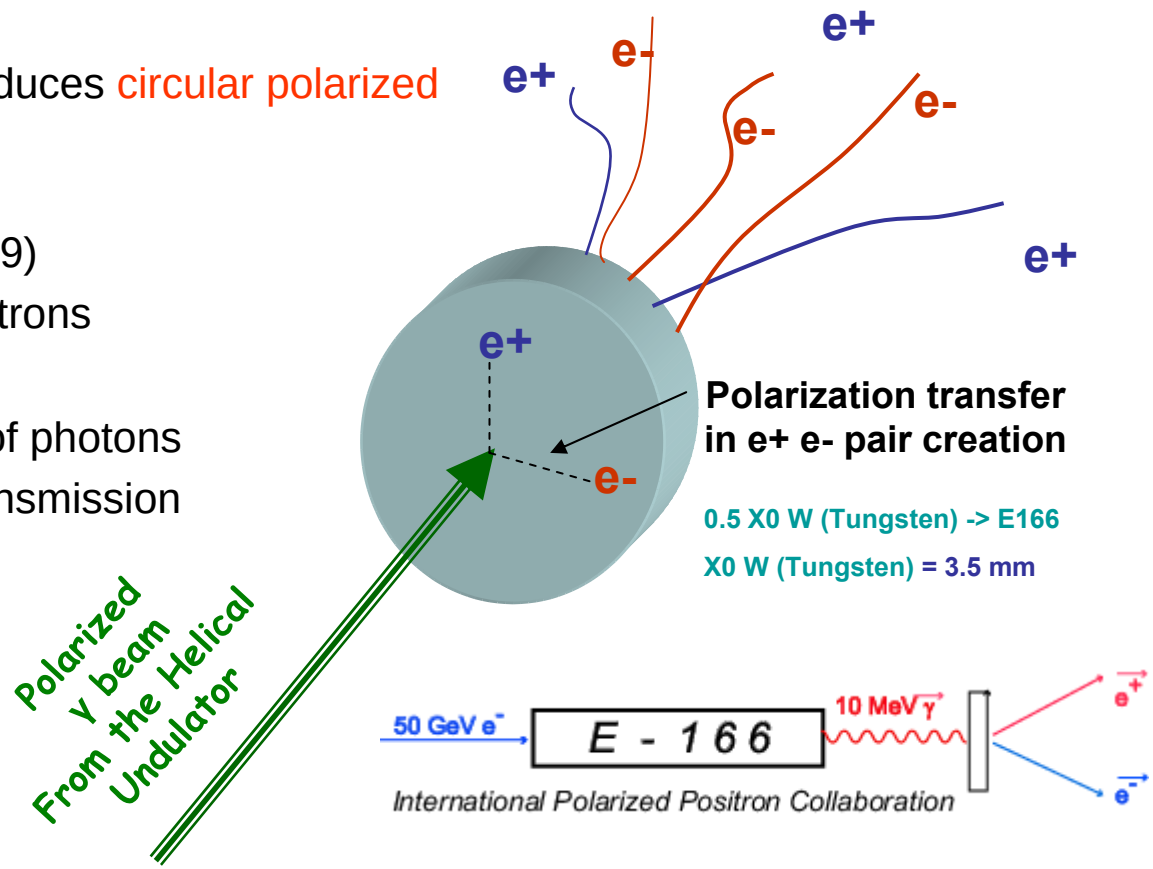
Geant4 Simulation for E166 Experiment at SLAC

Karim Laihem, Andreas Schaelicke,
and Pavel Starovoitov for E166 collaboration
DESY, Zeuthen

How to produce polarized positrons?

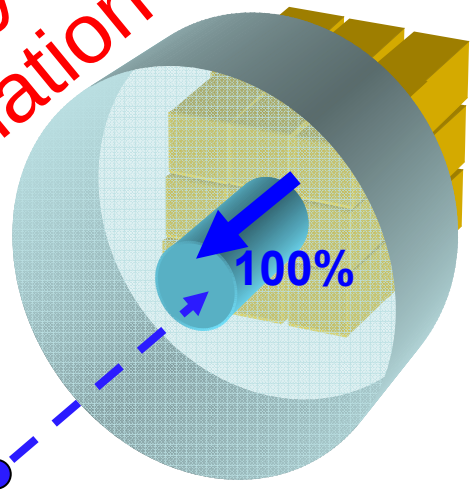
E166 Experiment at SLAC

- Experimental Demonstration for polarized e^+ production
- Final focus test beam (FFTB) at SLAC with 46.6 GeV electrons
- 1 m long helical undulator produces circular polarized photons
- Undulator radiation 0-10 MeV (Balakin & Mikhailichenko 1979)
- Conversion of photons to positrons in 0.2 X_0 W-target
- Measurement of polarization of photons and positrons by Compton transmission method

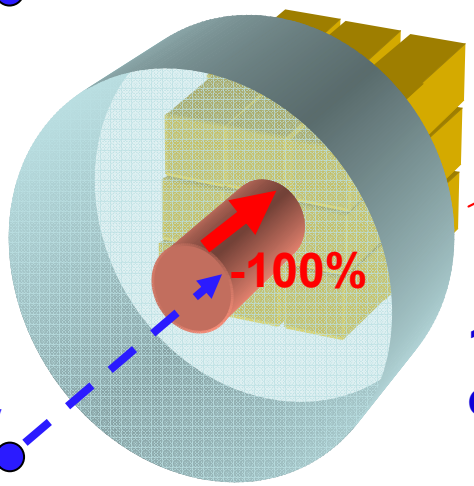


Measure Positron polarization by Compton transmission polarimetry

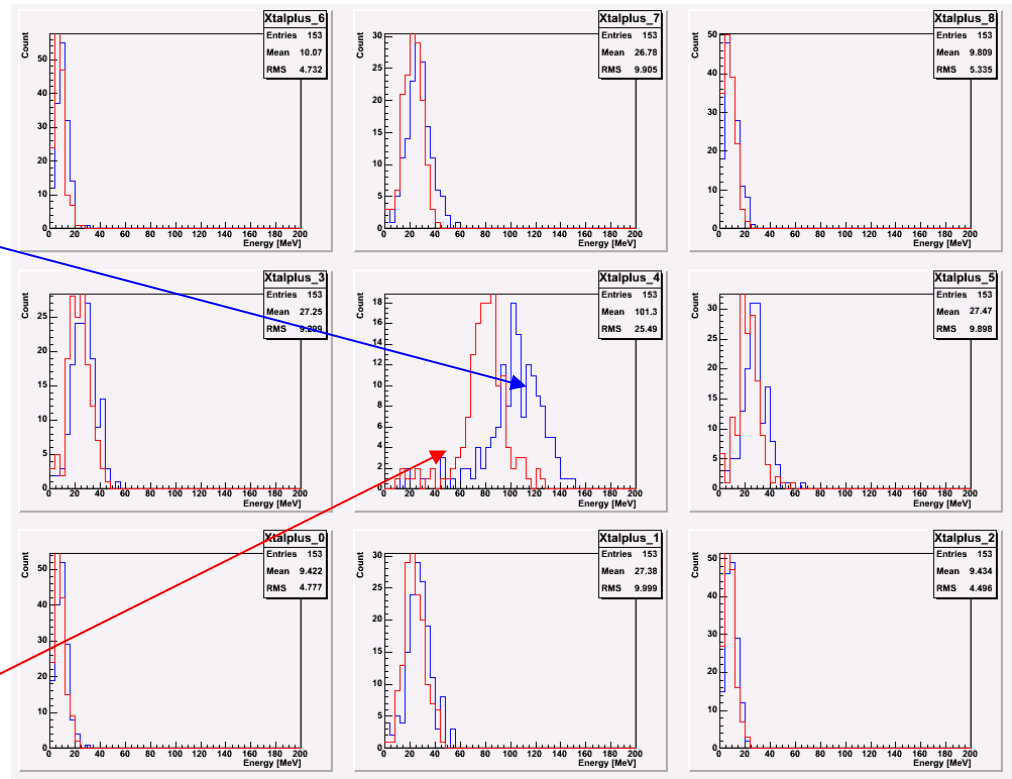
Preliminary
G4 simulation



N = 10 4
E e+ = 7 MeV
P e+ = 100%



N = 10 4
E e+ = 7 MeV
P e+ = 100%

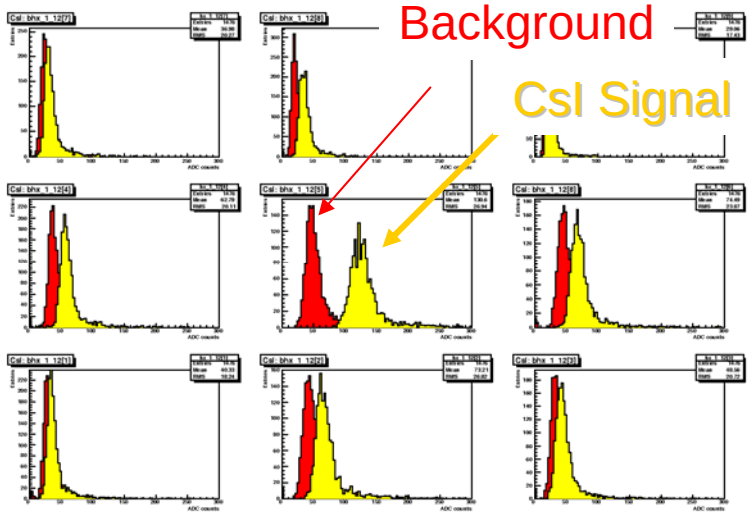


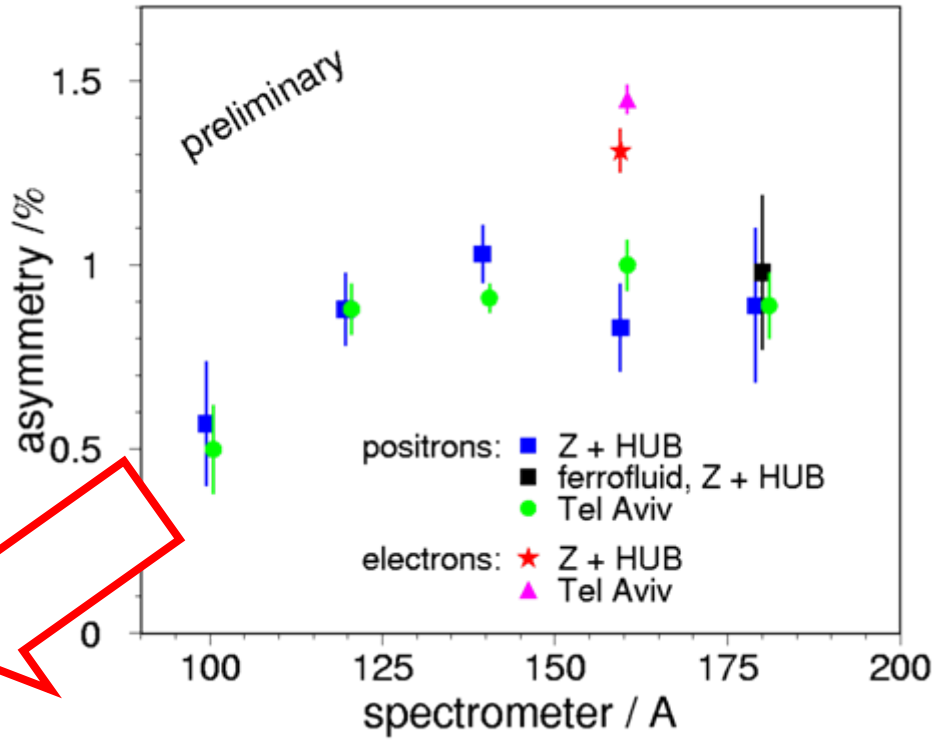
150 bunches of 10k e+ each

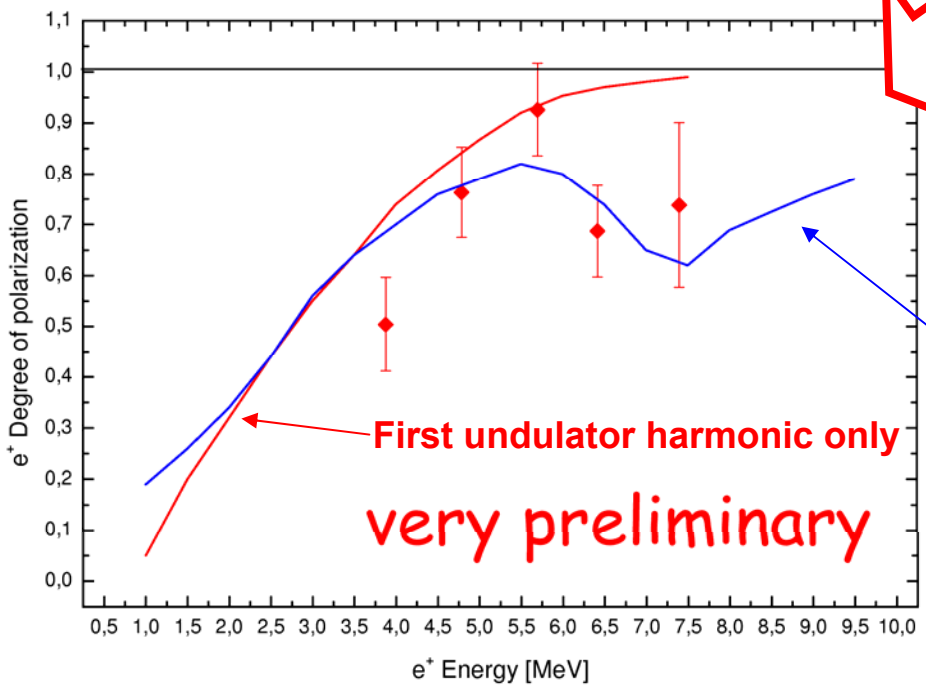
Asymmetry % = 13 ± 1.4

K. Laihem

Preliminary E166 results

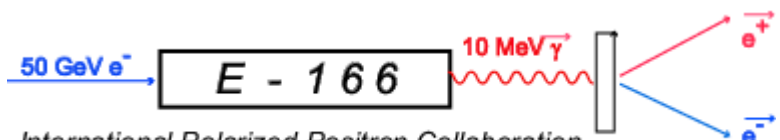






R. Dollan, et. al., E-166 note, February 28, 2006
G. Alexander, et. al., E-166 note, Feb. 19, 2006

Simulation including higher undulator harmonics



Comments from Vladimir

- Geant4 simulation for E166 is established by DESY group
  - Compton, Pair Production , Bremsstrahlung processes with polarization are developed
  - Polarization of the target is assigned to G4VLogicalVolume
- Very preliminary results demonstrate that E166 data can be understood with G4 simulation
- There is a dead line to publish results this year
- DESY group is willing to donate their development to Geant4