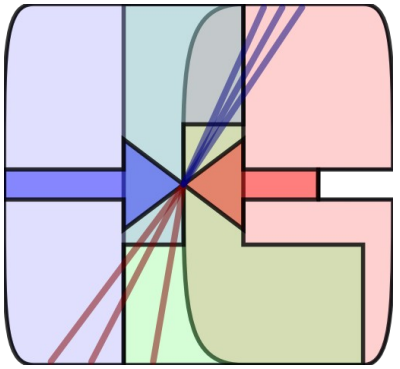
BDS Polarisation

CLIC meeting
November 3, 2011
J.List, DESY



BDS Issues for Polarisation

- for physics: need to know luminosity weighted polarisation average at the e+e- IP
  (ILC: dP/P=0.25..0.1%, CLIC: dP/P goal = ?)
- challenges:
  - develop polarimeter(s) achieving at least 0.25%
    - overall polarimeter design, chicane, laser..
    - detector for Compton e-
  - but polarimeter(s) not at IP, but up to 2km away
    -> spin tracking!
  - depolarisation in collision

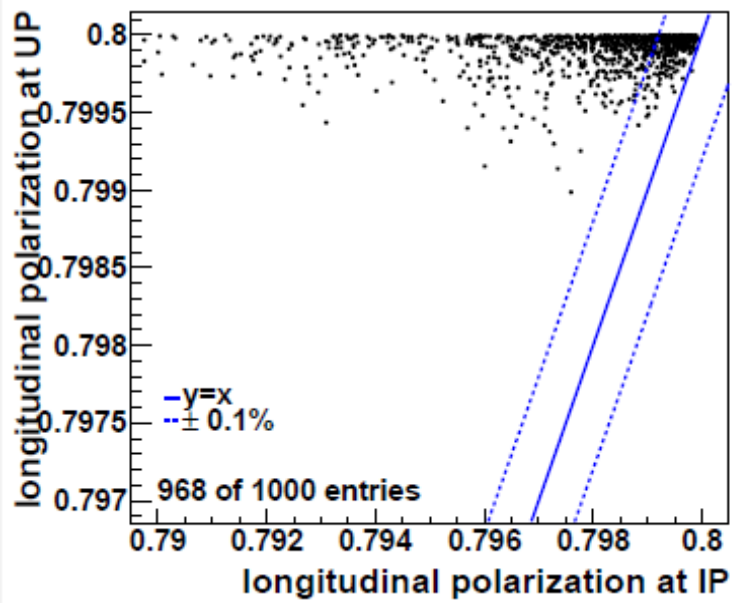
=> need to gauge simulation against physics process,
i.e. e+e- -> W+W-, or single W production or ....?

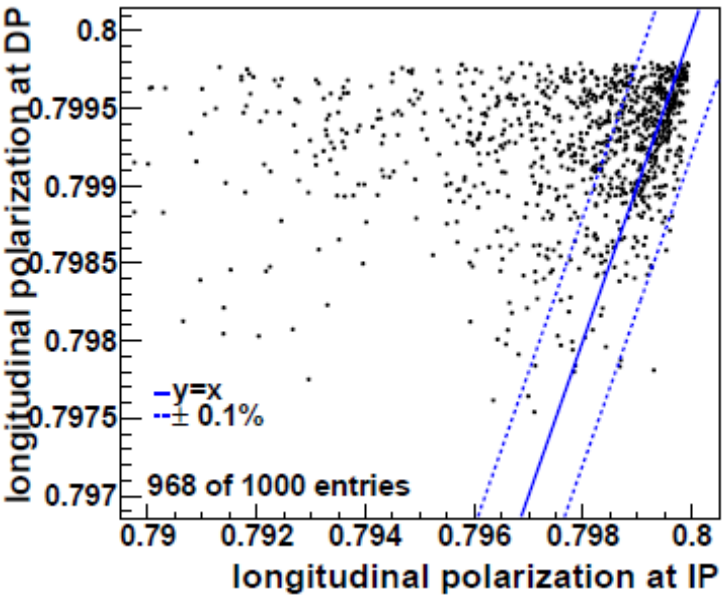
Overview of DESY activities

- sofar mainly in ILC context,
  but often transferable to CLIC:
  - Spin tracking in the BDS
  - QED strong field calculations
    and application to depolarisation in collision
  - Polarisation and TGC from e+e- -> W+W-
  - Polarimeter design (upstream)
  - Detector development for high precision
    Compton-Polarimetry (dP/P = 0.25%)

Spin Tracking in the BDS (M.Beckmann)

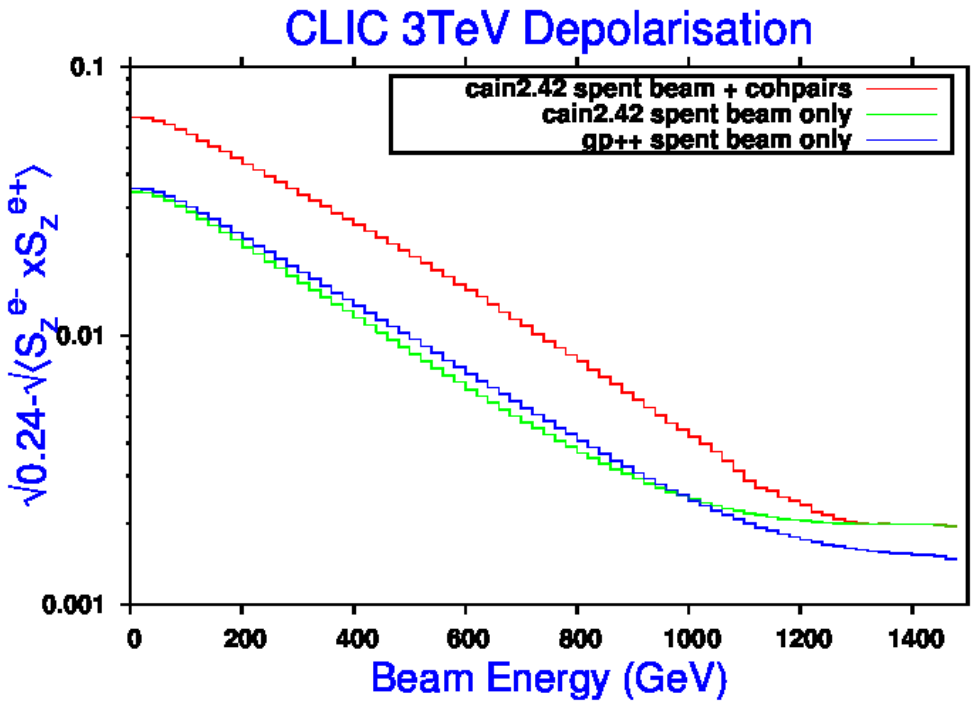
- using BMAD, implemented spin tracking in misaligned magnets
- currently based on ILC SB2009_Nov10 lattice
  - studying:
    - static and timedependent misalignments
    - effect of detector solenoid, anti-DID
    - crab crossing, travelling focus...
- example:
  static misalignments in x,y
  random 5um (50nm final focus)
  long. P at: UP vs IP
  DP vs IP





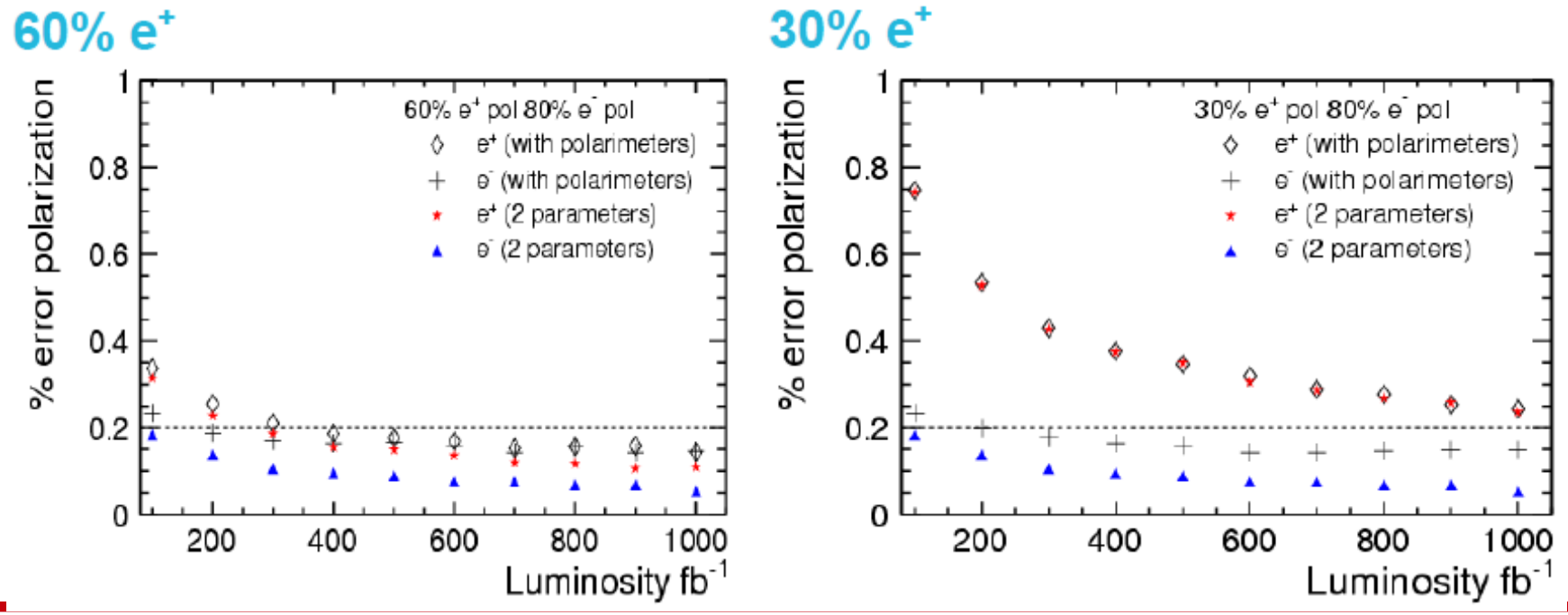
Strong fields and depolarisation in collision
(A.Hartin)

- calculation of strong field effects on
  - e+e- cross-sections (e- / e+ don't react as single particles in vacuum anymore (classical QFT), but in em-field of the bunches
    => studies ongoing, if sizeable then fundamental to CLIC physics!
  - polarisation, implementation in simulation tools
  - example: depol. in collision at 3 TeV CLIC = 3.5%



Polarisation and TGCs from e+e- -> W+W-
(I.Marchesini)

- goal: calibrate the long-term luminosity weighted polarisation average
- measure cos(theta) dependence of cross-section for LL,RR LR,RL, fit for P and triple gauge couplings
- cannot replace polarimeters: slow, and systematically limited by correction for unequal |P| of the 4 datasets



Polarimeter Design (JL)

- chicane design
- integration in BDS
- backgrounds, ...

  => multipurpose tool: LCPolMC
  - Compton MC Generator
  - tracking of Compton e- through a series of dipoles
  - fast simulation of detector
- could be interesting for CLIC

Detector development (A.Vauth, B.Vormwald)

- calibration system for Cherenkov detector to sub-percent precision
- alternative detector concepts
- built and operated prototype in testbeam

  => in principle generic, but to be decided if relevant for CLIC: due to high depolarisation in collision, percent-level precision from polarimeters might be enough