

ILC Positron Source Meeting,  
ANL, Sep 2007



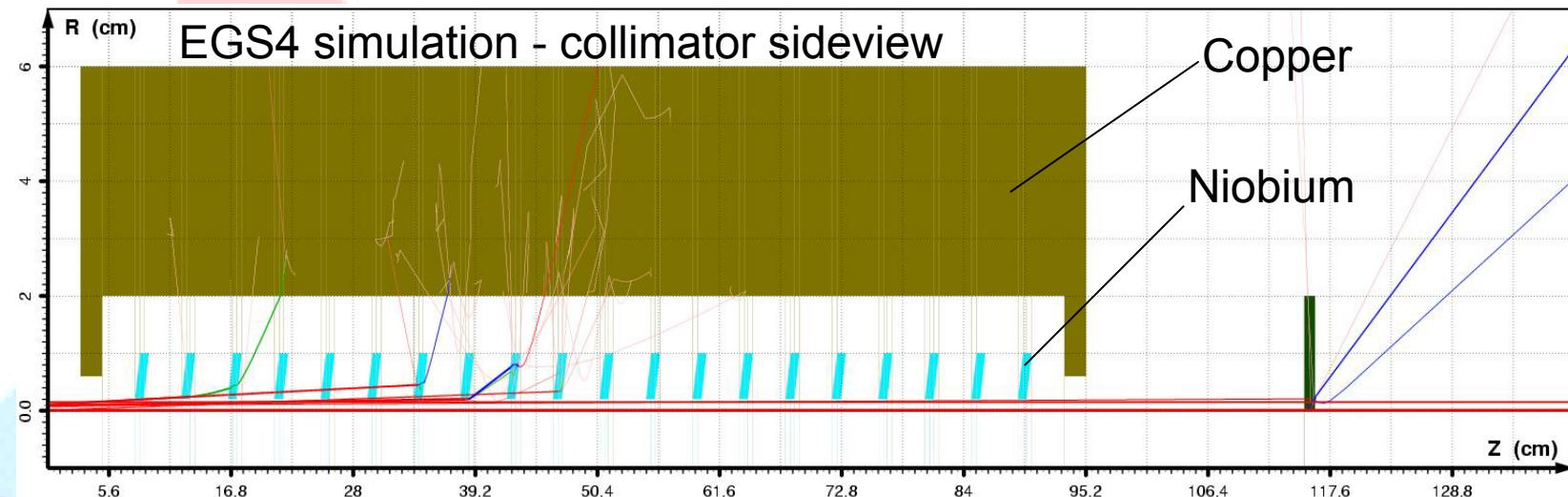
# Photon and Positron Collimation - Polarization Effects

Ian Bailey

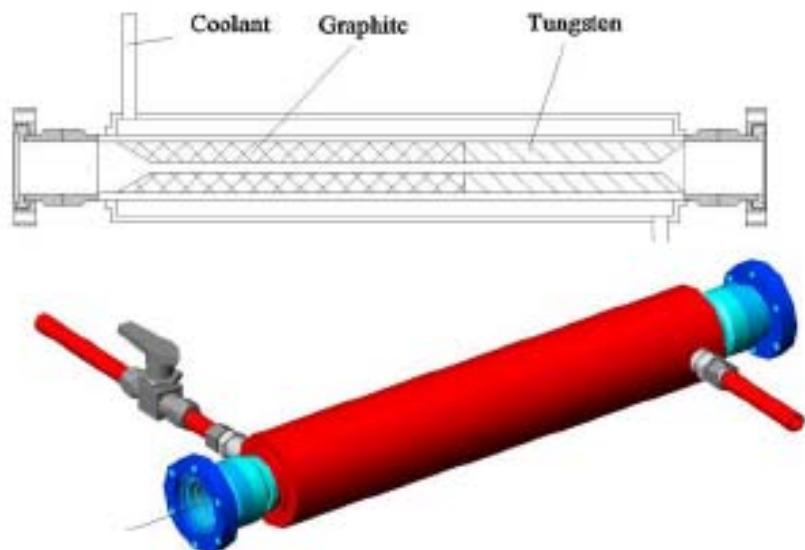
University of Liverpool / Cockcroft Institute



# Photon Collimator



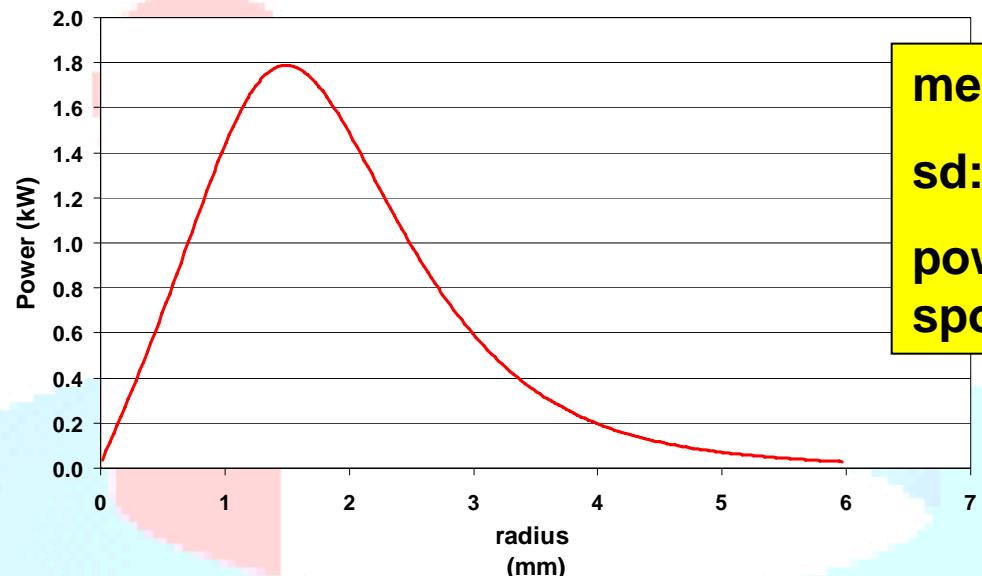
N. Golubeva and V. Balandin, DESY



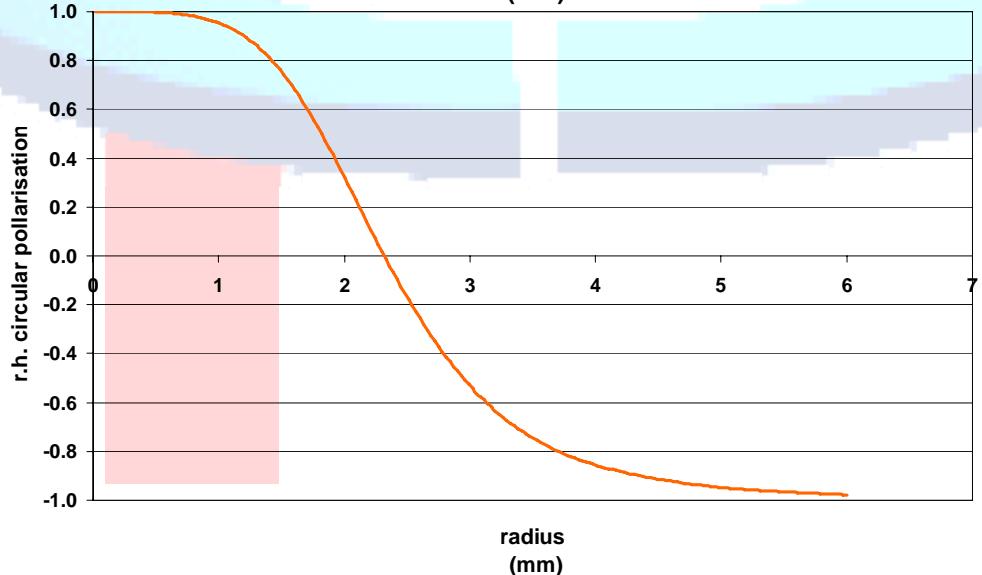
## Purpose of collimator

- Scrape beam?
- Adjust beam polarisation

# Beam Spot Characteristics



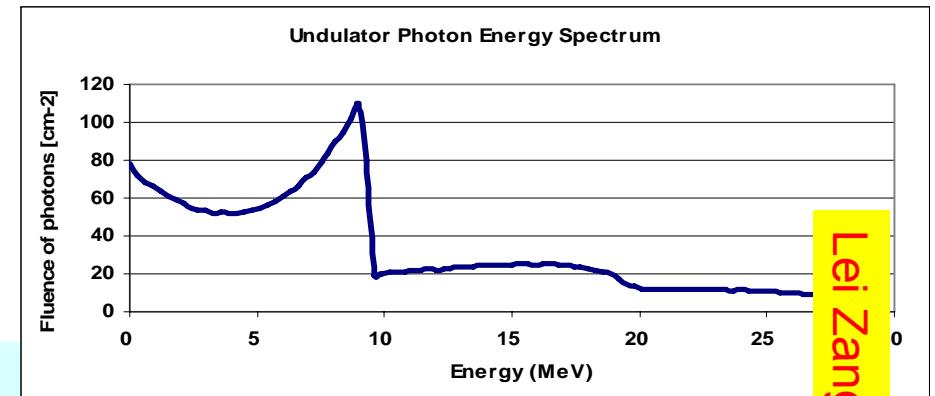
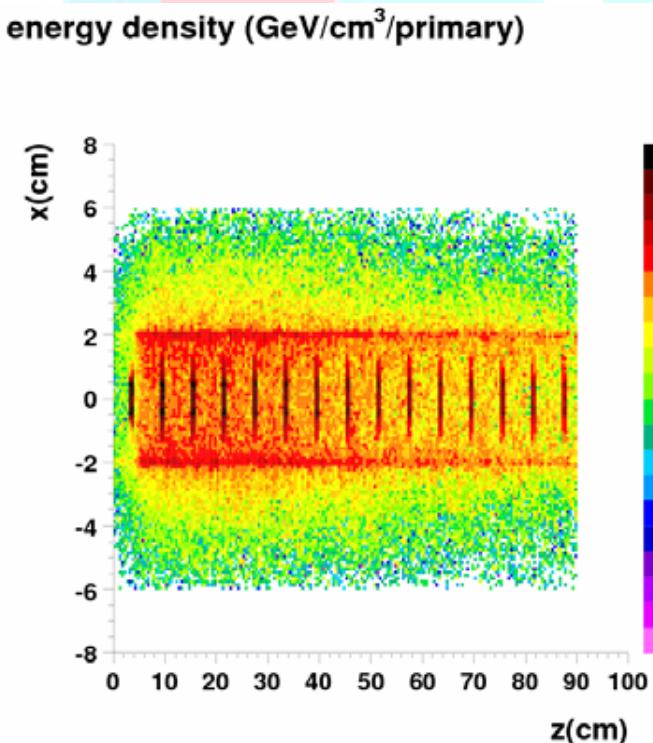
mean: 1.9 mm  
sd: 1.0 mm  
power-weighted beam spot rms: 2.2 mm



(Simple simulation of a continuous undulator without misalignments, collimation or electron beam jitter.)

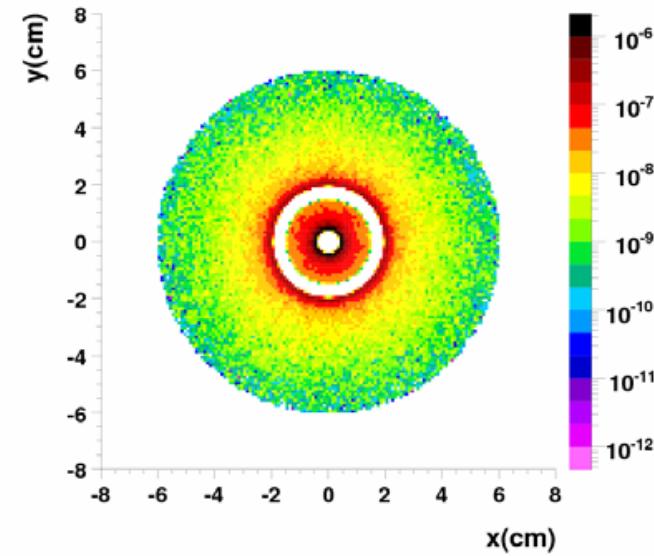
# FLUKA Photon Collimator Simulations

Simulations started in FLUKA  
Calculating energy deposition,  
peak and average heating.  
Investigating cooling solutions.



energy density ( $\text{GeV}/\text{cm}^3/\text{primary}$ )

e



Lei Zang, University of Liverpool

# Photon Collimator - Status

- Collimator design requires realistic photon beam angular distribution
  - Want to generate unweighted MC events in FLUKA
  - Original work assumed Gaussian photon angular distribution
  - Now using  $\omega_\gamma = n\omega_1(\theta)$   $\omega_1 = \omega_0 / (1 - \beta^* \cos\theta) \approx 2\gamma^2\omega_0 / (1 + K^2 + \gamma^2\theta^2)$
  - Only valid if  $\sigma^2 > 1/N\gamma^2$
  - I.e. Electron beam divergence dominates over natural spread
  - Validating approximation against full 2d ( $E, \theta$ ) distribution
  - Will repeat earlier work on energy deposition, etc using new distributions
  - Next step is polarization ( $\Rightarrow$  GEANT4)

# Related Work in Progress

- ANL simulations - ?
- DESY G4 simulations - Andriy Ushakov
- Simulation of realistic spectra from modular undulator - Duncan Scott
- SLICKTRACK undulator simulation ( $e^-$  beam) - Des Barber
- Introduction of T-BMT into ASTRA - Leo Jenner, Andriy Ushakov, Klaus Flottmann
- Converging on positron source spin tracking simulation
- Damping ring injector simulations - Kai Hock

# Future Aims

- ‘Official’ photon distribution to standardise simulations?
- Integrate positron source polarisation simulations with other ILC spin tracking simulations.
- Include collimators in activation simulations.
- Engineering design for collimators.