

SGP Full Simulation Update

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Current Status

- FLUKA photon detection system (forward spectrometer) geometry updated – includes electron dump and wall as well as SGP pairs in two locations
- Separation between profiler plates increased to 1.0 cm
- Simulation of background noise in PDS produced by 16.5 GeV electron beam after IP
- Thanks to Antonello's code, segmentation of profiler can be implemented (not done for background)



Updated FLUKA geometry





Electron Background Simulation

- 16.5 GeV electron beam propagating from IP into spectrometer setup
- Currently, only 10 x 10**4 primaries simulated in reality, ~10**9 electrons anticipated per BX
- FLUKA simulation uses an air environment this may change, active part of LUXE meetings



Full Setup Results





SGP 11 - Photon





-0.6

-0.8

-0.2

-0.4

0.2

0

0.4

0.6

0.8

1

x (cm)

SGP 12 - Electron



Expected Signal

Photon Distribution on Profiler - HICS 16.5 GeV 50 μ m





Results Summary

- At this level of statistics, rear profiler pair sees no background noise
- For forward pair, photons are main component of noise
- For 10**9 electrons/BX, this gives 4.8 x 10**6 photons/cm^2 as the mean occupation on the forward profiler pair
- Noise tracks have no structure that would interfere with discerning the shape of the main photon beam
- S/B ~ 100-1000 within central 0.4 x 0.4 cm**2



Segmentation of Profiler

- Currently, profiler included in simulation as a block of sapphire of appropriate size
- Two possible ways of including segmentation
- Individually divide the detector into 200 x 50 strips this is not ideal in FLUKA as at least 4 cards needed to define a single strip (solid type, region, material, scoring)
- Alternatively, segment the profiler during scoring stage into 200 x 1 x 50 bins



Things to do

- Increase the number of primaries in background simulation to improve statistics and verify previous results
- Implement segmentation of detector
- New full scale GEANT4 geometry now includes profilers working on converting this to FLUKA format
- Implementing an elliptical beam profile into FLUKA