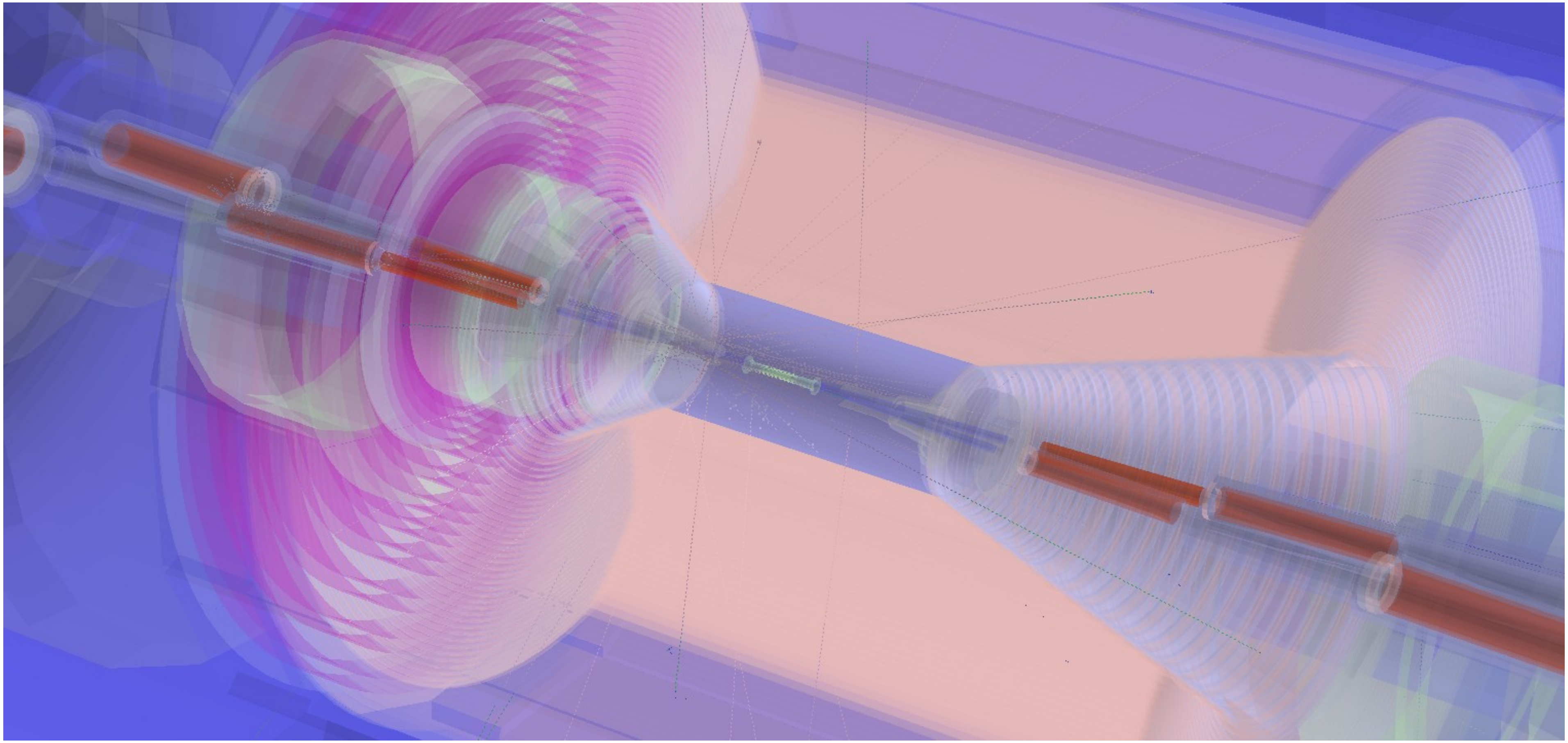
7th Belle II VXD Workshop and 18th International Workshop on DEPFET Detectors and Applications
Charles University in Prague, 21-23/01/2015

Preparation of BEAST 2 Simulation



Gianluca Inguglia- DESY

23/01/2015

Analysis plan - short term
(as agreed with Carlos Marinas, Igal Jaegle, Sven Vahsen)

Diamonds:

- Where to put them (horizontal or vertical)?
- Expected rates (from the different types of backgrounds)?
- Dose rates?

Work in progress. Preliminary results on Touschek and RBB (HER+LER) shown today. Many thanks to Martin Ritter for providing codes and useful suggestions/support

Neutrons on the ASICs:

- Which neutron rates are expected?
- Energy spectra?

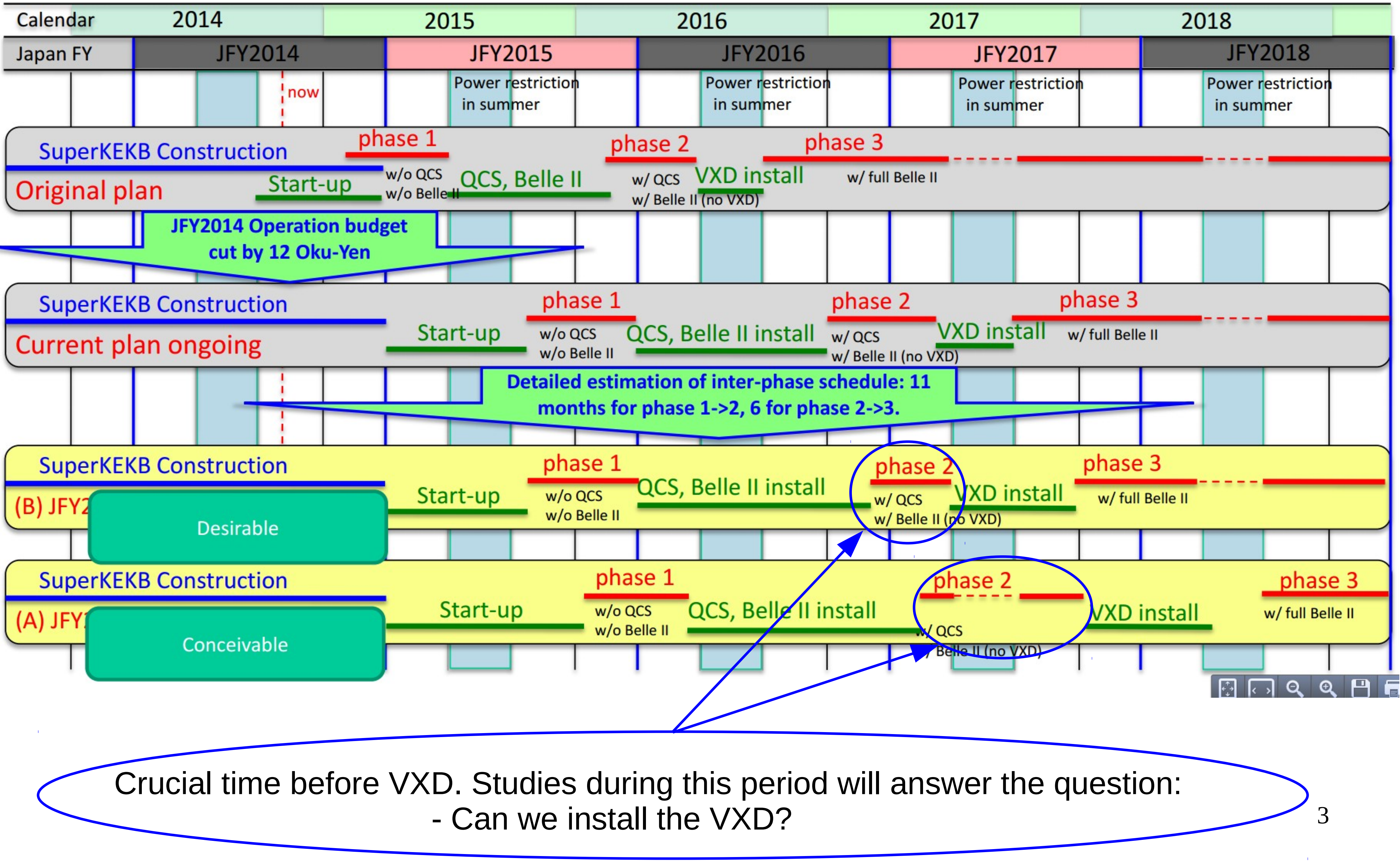
Plan to start after diamond sensors studies.

FE-I4 based sensors:

- Where to put them? Expected rates?
- Synchrotron radiation?

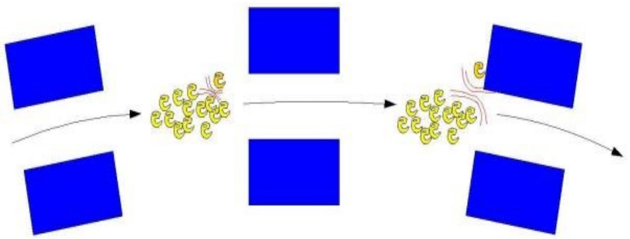
Plan to start after diamond sensors studies.

Belle 2 Schedule
(not the latest, however...)

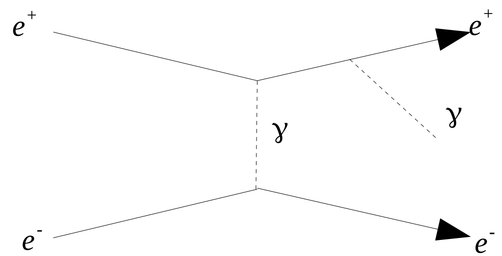


Main backgrounds to study for BEAST II

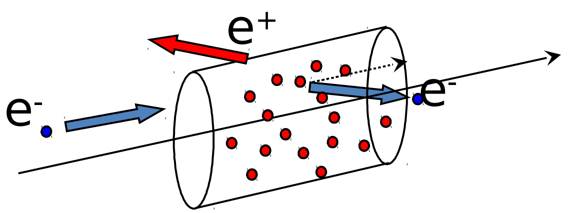
Touscheck (Beam-induced)
Intra-beam Coulomb scattering process
$\propto(\text{beam size})^{-1}(E_{beam})^3 N_b\, I_b^{\,2}$



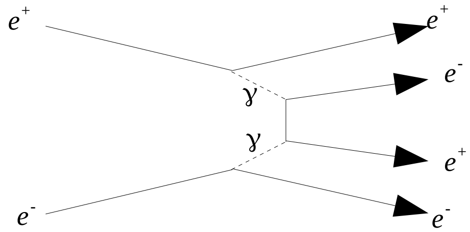
Radiative Bhabha (luminosity induced)
$\propto$Vacuum level, beam current
100 x KEKB.



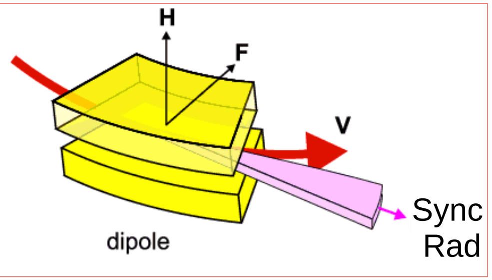
Compton (Beam-induced)
Neutrons produced from the the interaction of photons with iron of the magnets.



2-photon (luminosity induced)
Low momentum e^+e^- pair . Previous studies shown it to be below limits required for pixels.

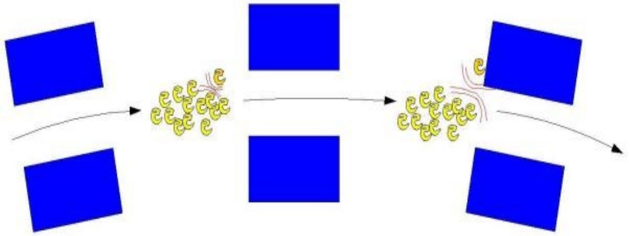


Synchrotron (Beam/luminosity induced)
Scales with beam energy^2 (and B^2). HER main source.
Belle SVD inner layer heavily damaged by 2 KeV x-rays during first stage



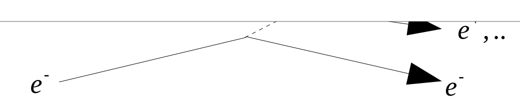
Main backgrounds to study for BEAST II

Touscheck
Intra-beam Coulomb scattering process
Scales with particle density^2 per beam bunch



In Addition to these:

- Injection background
- “Unexpected” background



Synchrotron
Scales with beam energy^2 (and B^2). HER main source.
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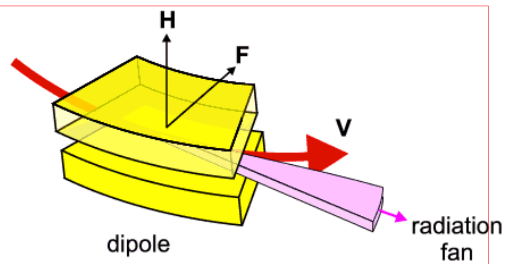
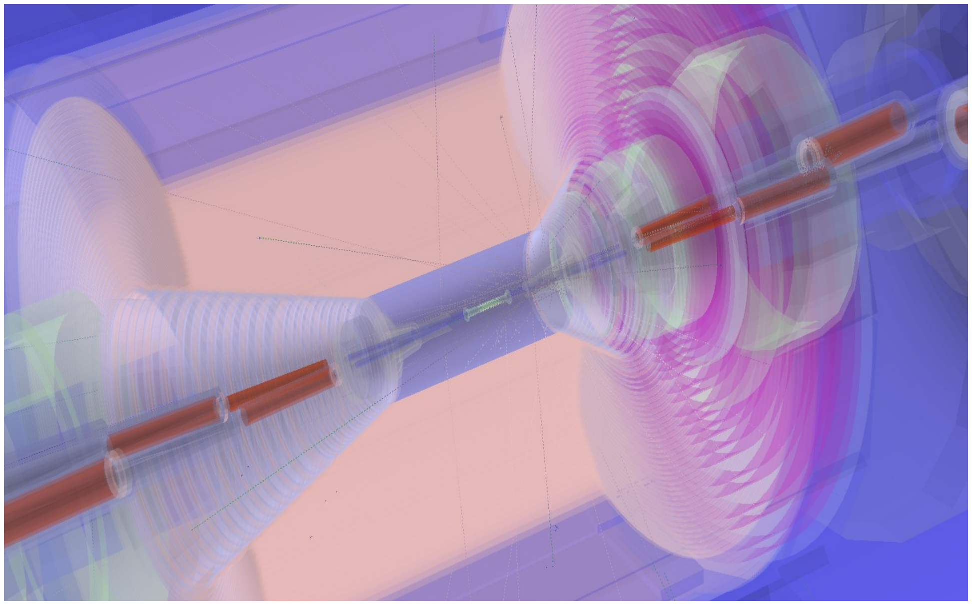
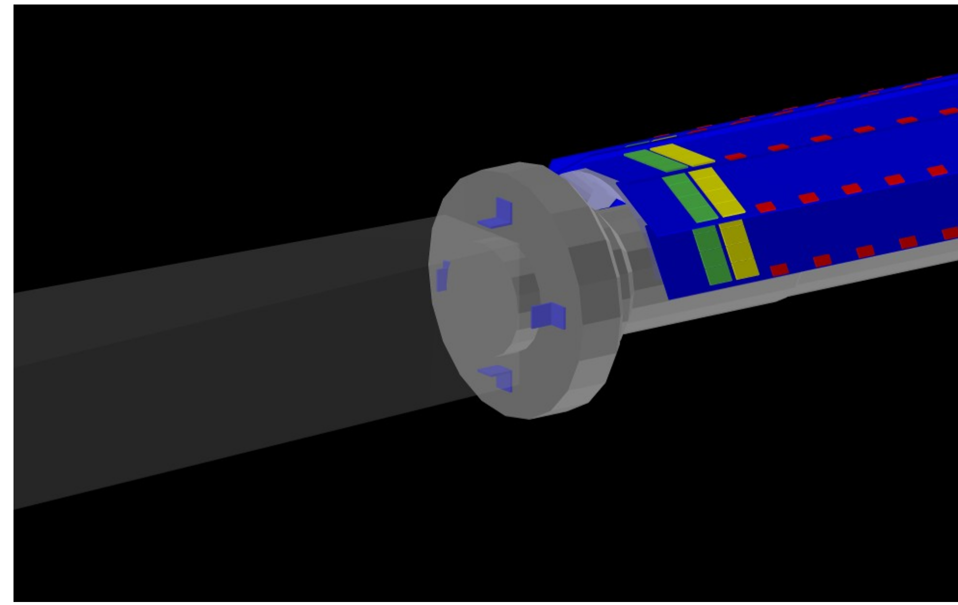
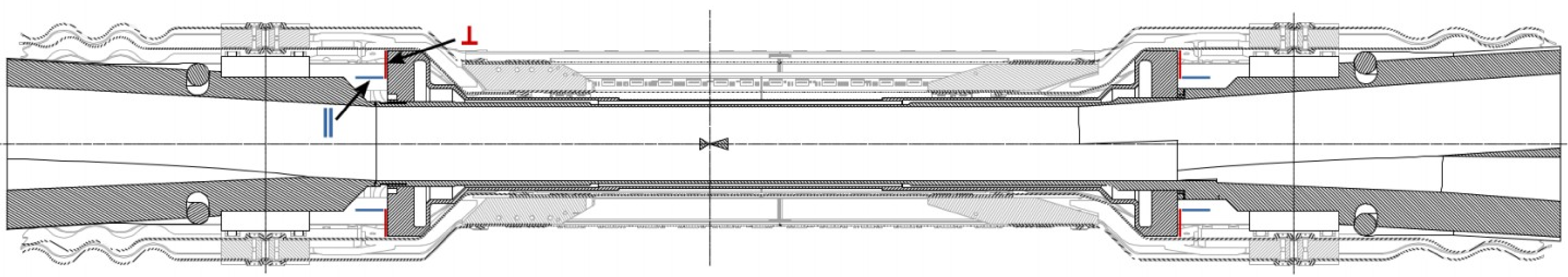


Diamond sensors



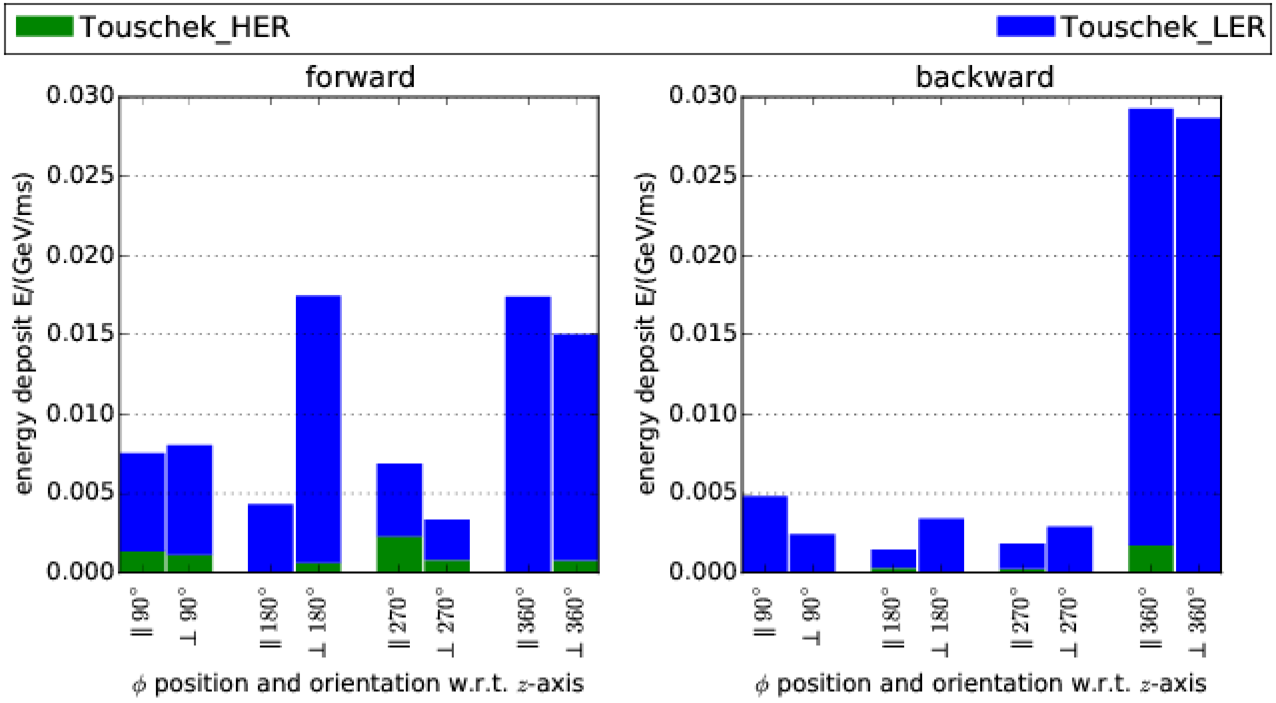




4 sensors in each direction positioned at φ=0, 90, 180, 270 [deg] with 2 possible configurations, one parallel and one orthogonal to the z-axis.

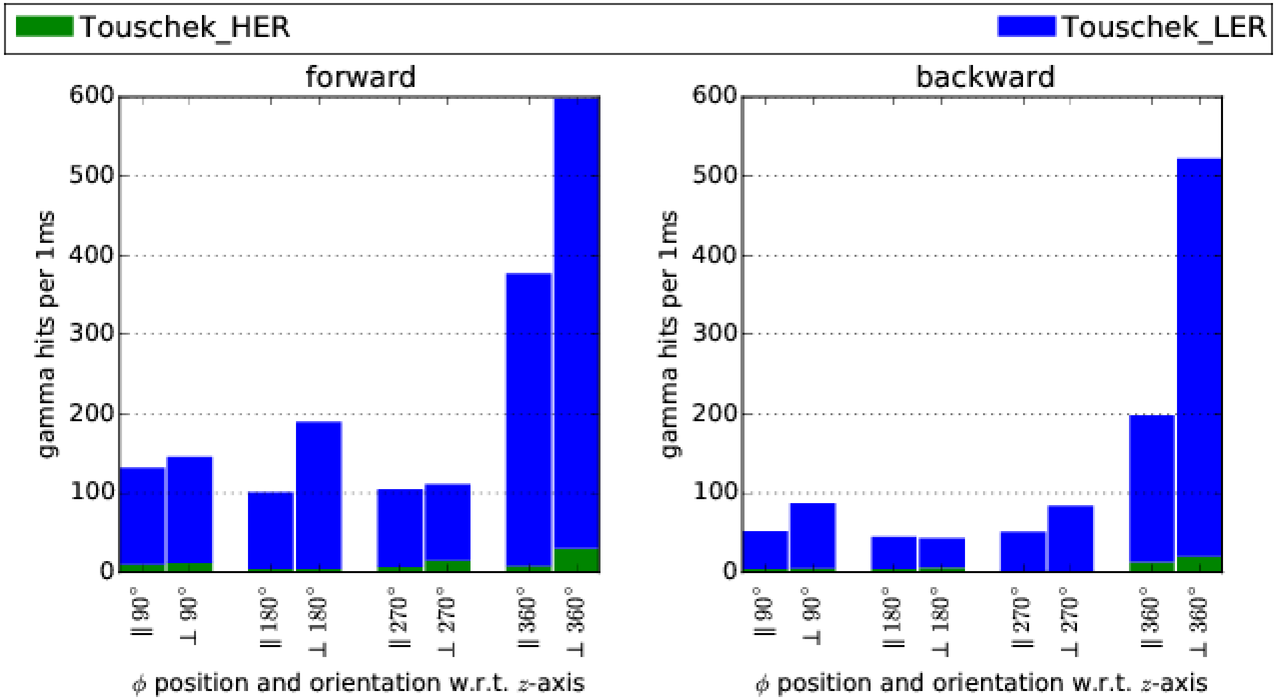
Touschek Background

Energy Deposit as a function of sensor position and orientation wrt to z-axis



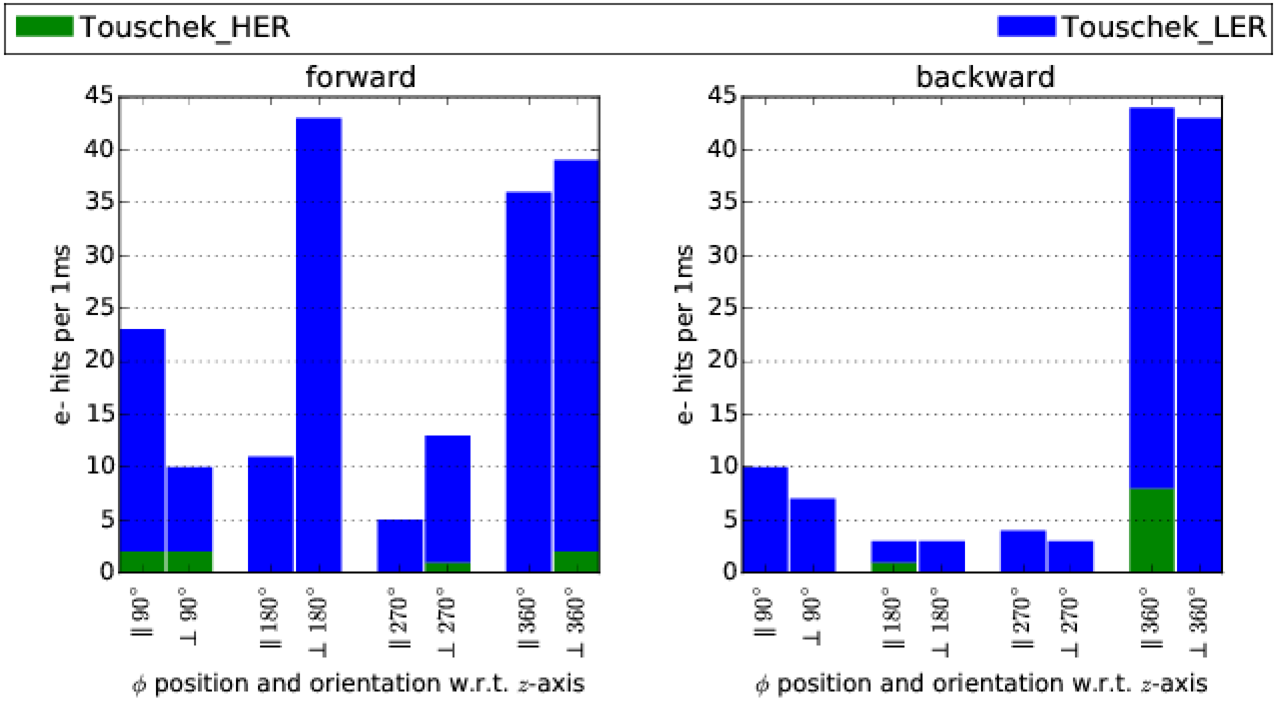
Touschek Background

Particle fluence (γ) as a function of sensor position and orientation wrt to z-axis



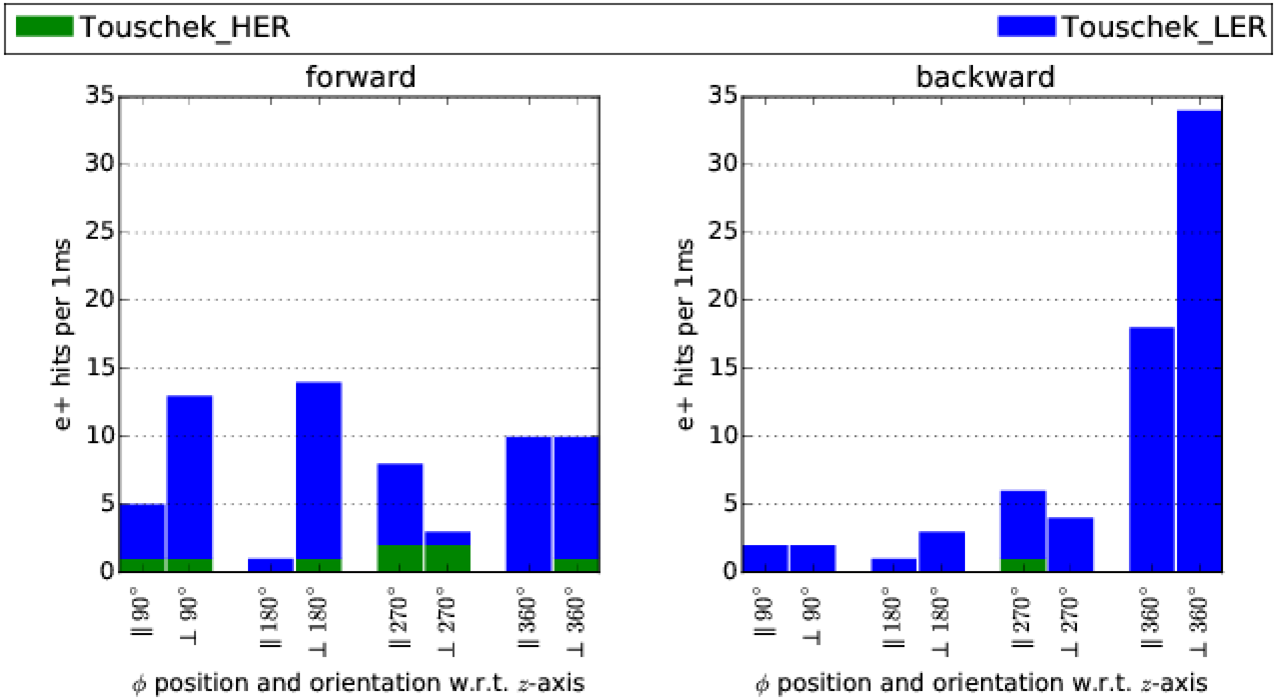
Touschek Background

Particle fluence (e^-) as a function of sensor position and orientation wrt to z-axis



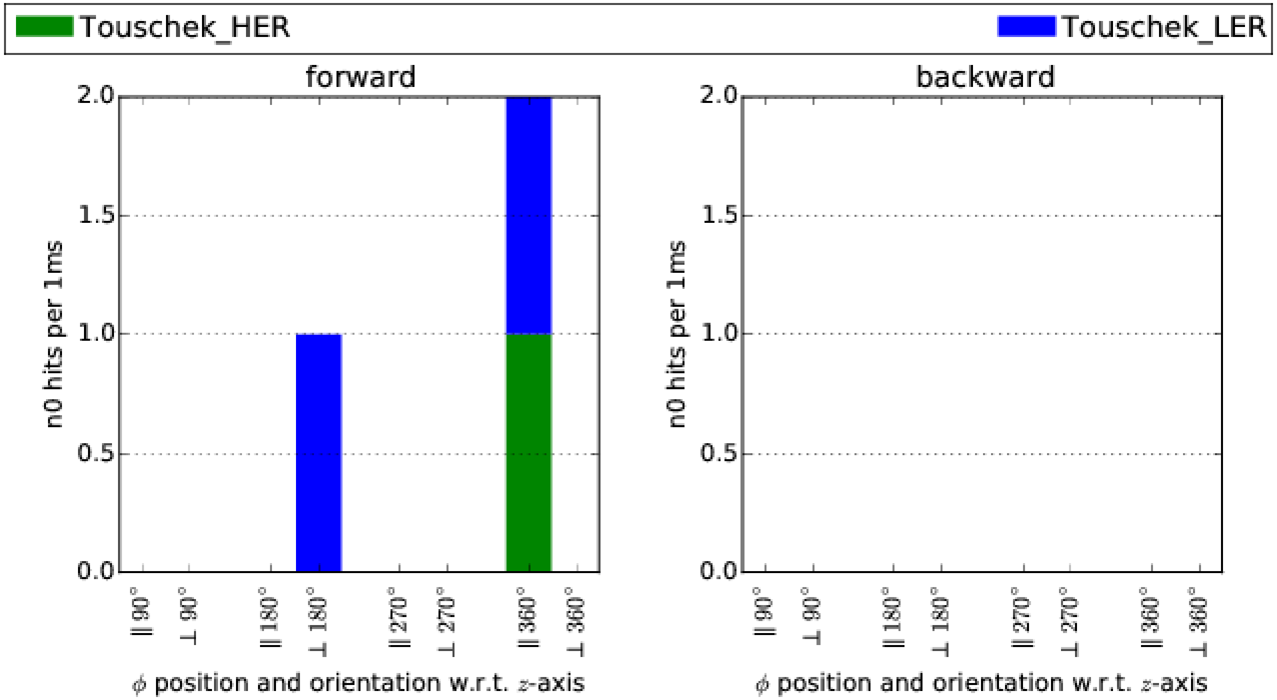
Touschek Background

Particle fluence (e^+) as a function of sensor position and orientation wrt to z-axis



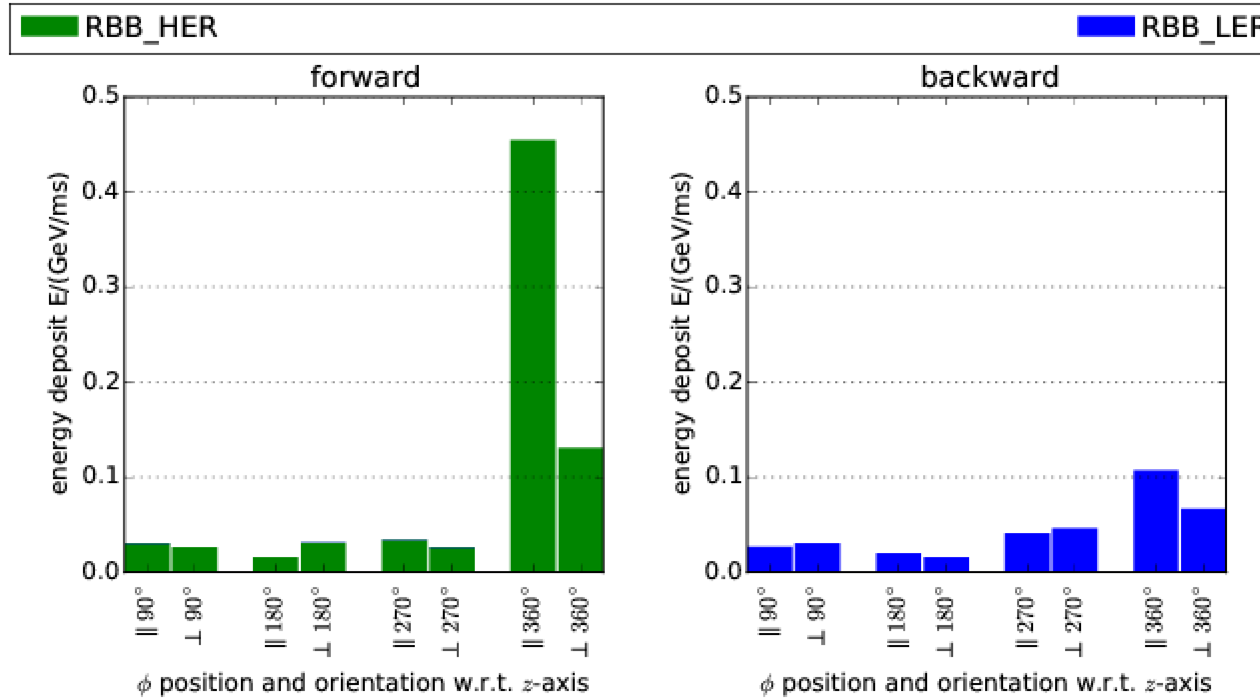
Touschek Background

Particle fluence (n) as a function of sensor position and orientation wrt to z-axis



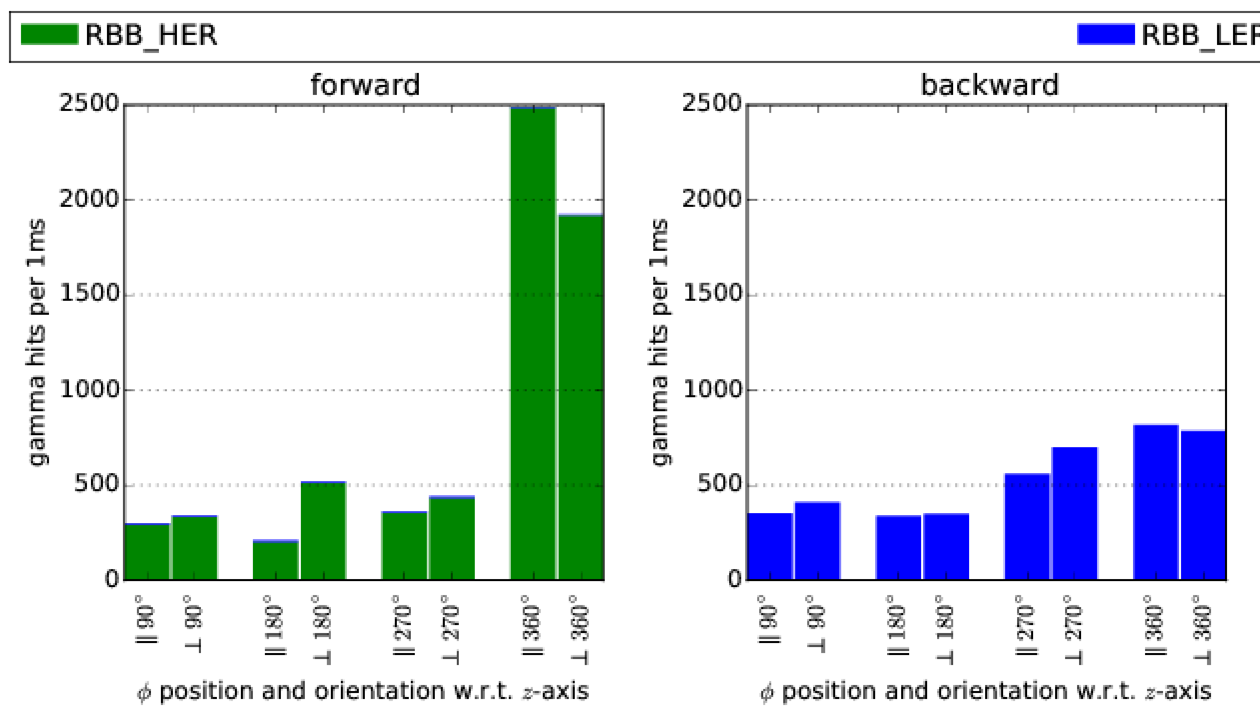
Radiative Bhabha Background

Energy Deposit as a function of sensor position and orientation wrt to z-axis



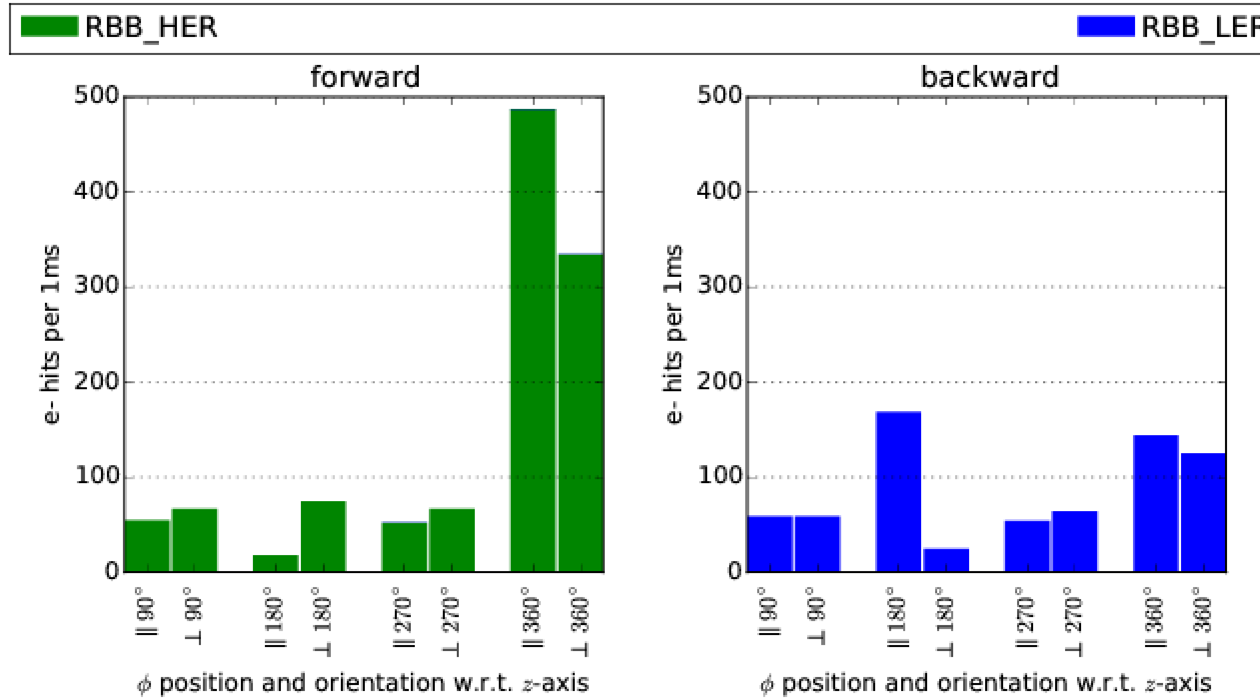
Radiative Bhabha Background

Particle fluence (γ) as a function of sensor position and orientation wrt to z-axis



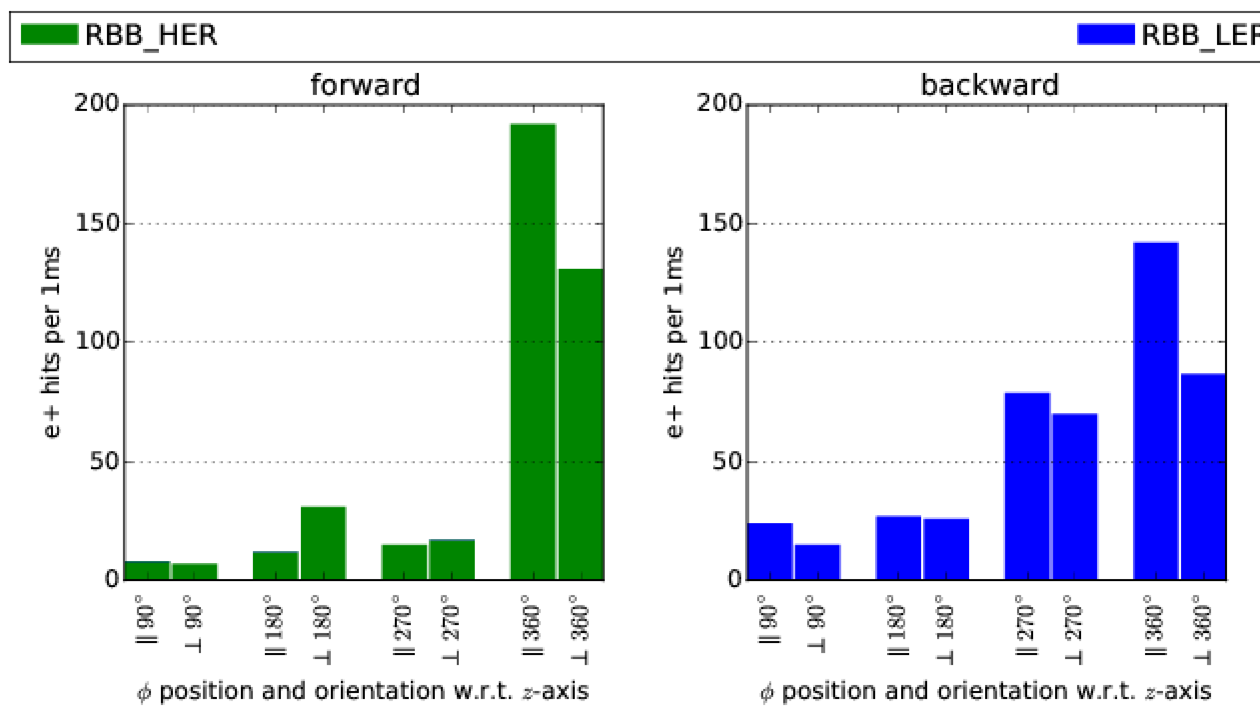
Radiative Bhabha Background

Particle fluence (e^-) as a function of sensor position and orientation wrt to z-axis



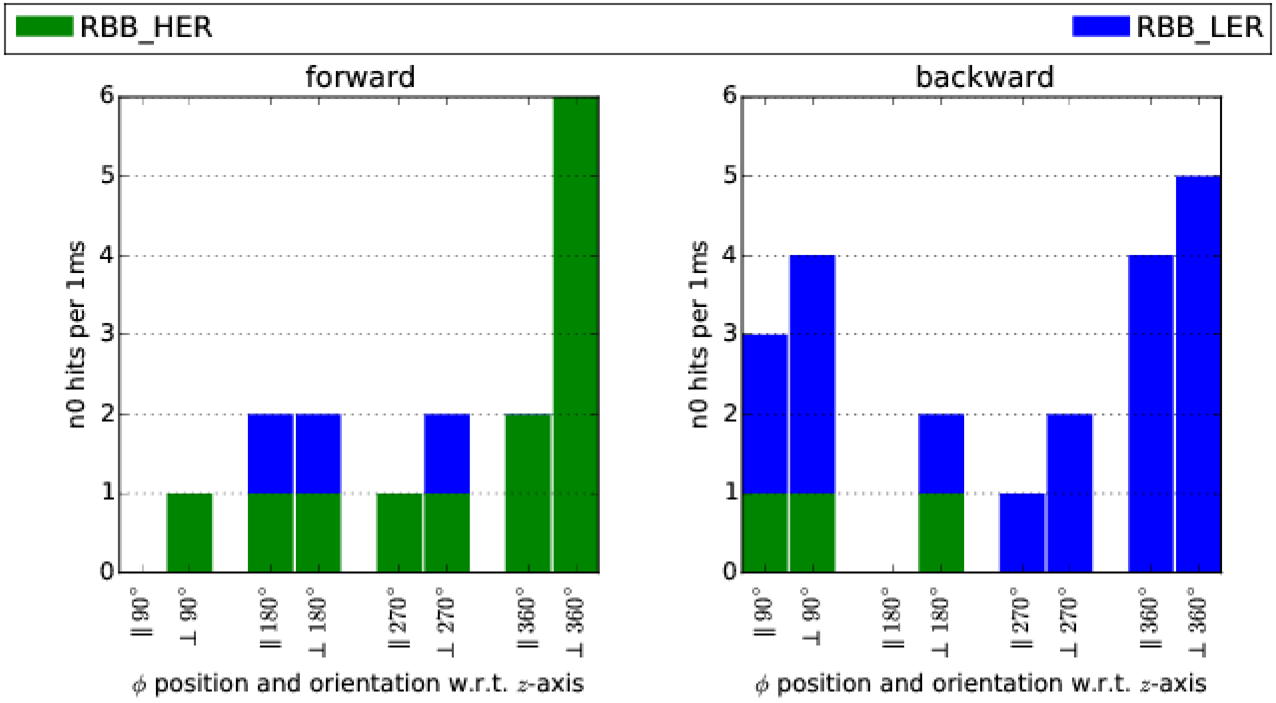
Radiative Bhabha Background

Particle fluence (e^+) as a function of sensor position and orientation wrt to z-axis



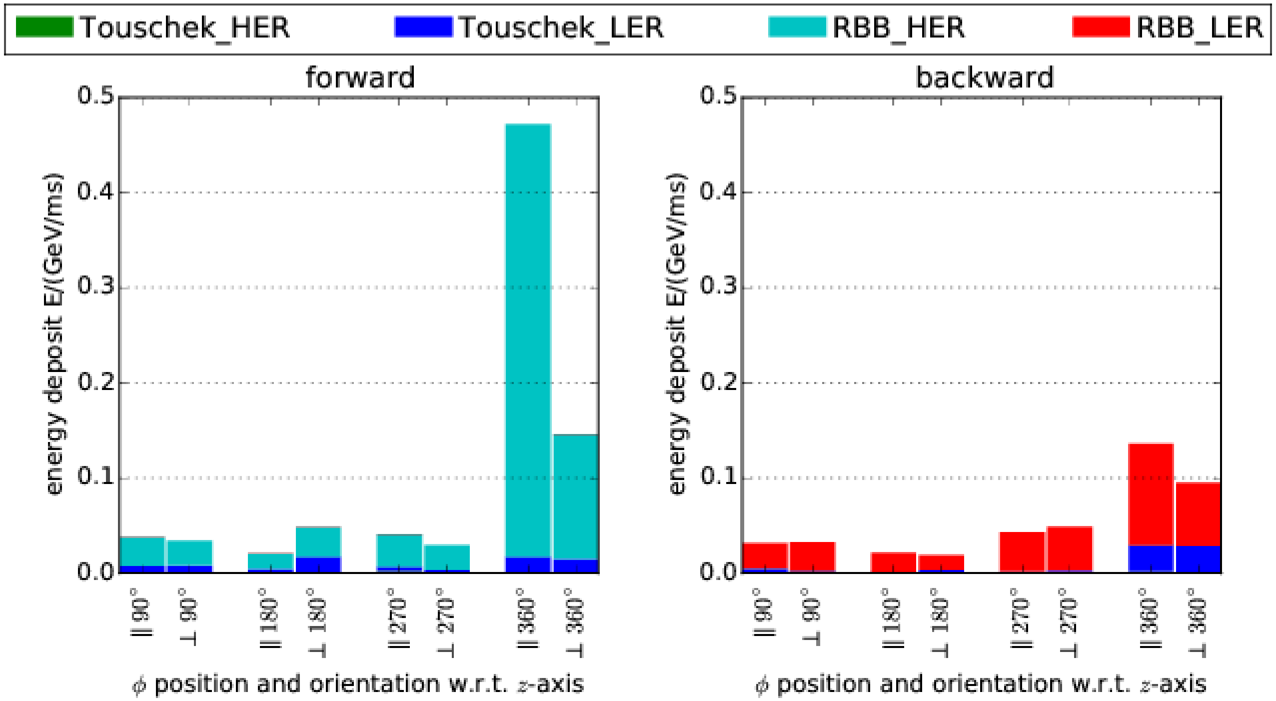
Radiative Bhabha Background

Particle fluence (n) as a function of sensor position and orientation wrt to z-axis



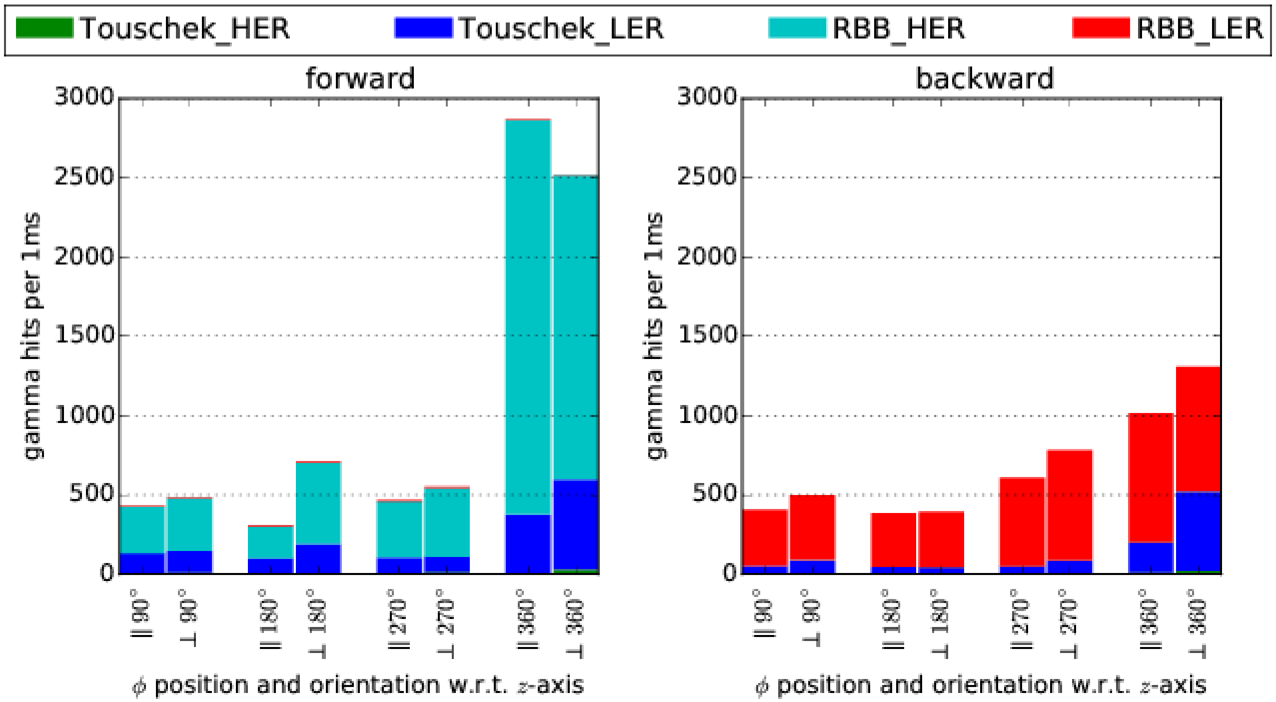
Combined Touschek+ Radiative Bhabha Backgrounds

Energy Deposit as a function of sensor position and orientation wrt to z-axis



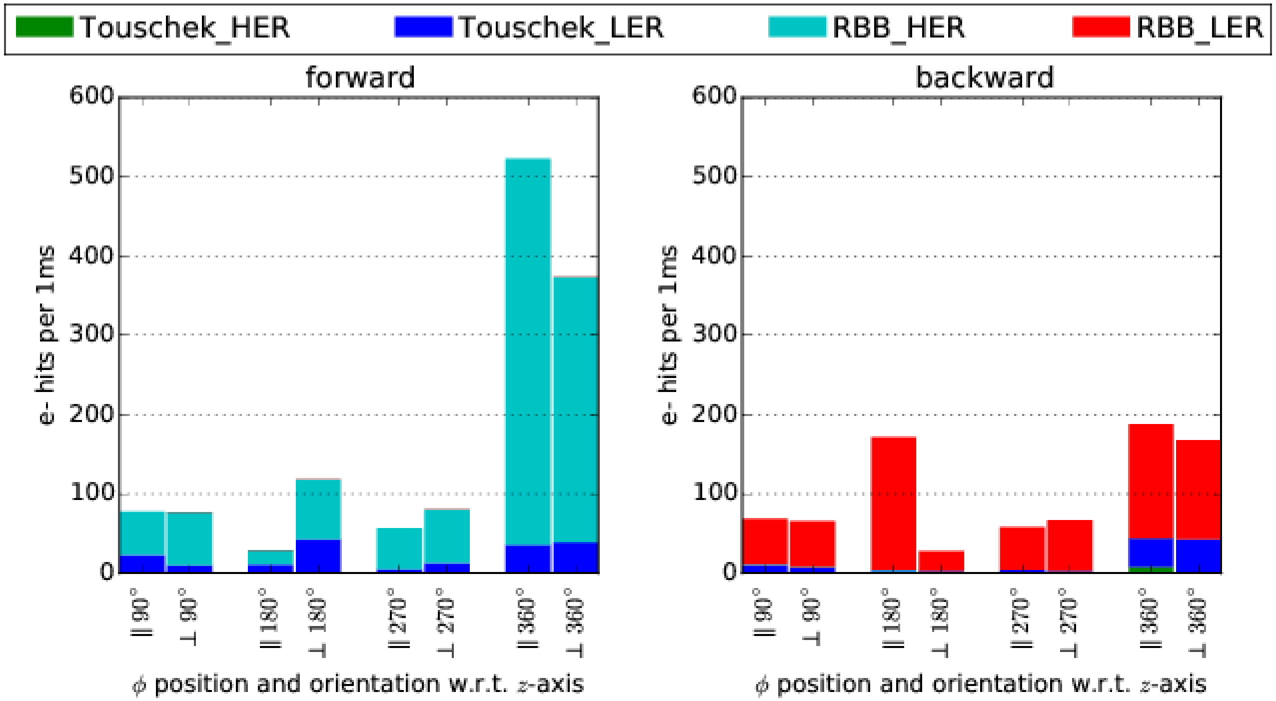
Combined Touschek+ Radiative Bhabha Backgrounds

Particle fluence (γ) as a function of sensor position and orientation wrt to z-axis



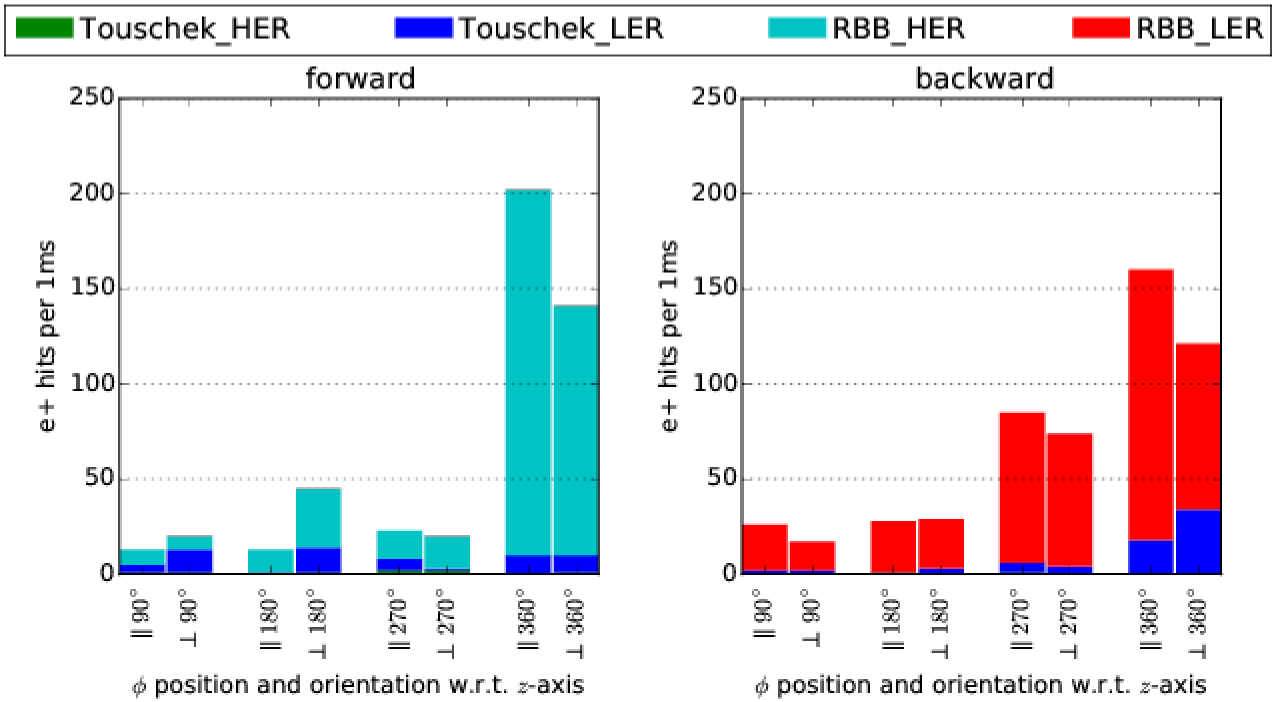
Combined Touschek+ Radiative Bhabha Backgrounds

Particle fluence (e^-) as a function of sensor position and orientation wrt to z-axis



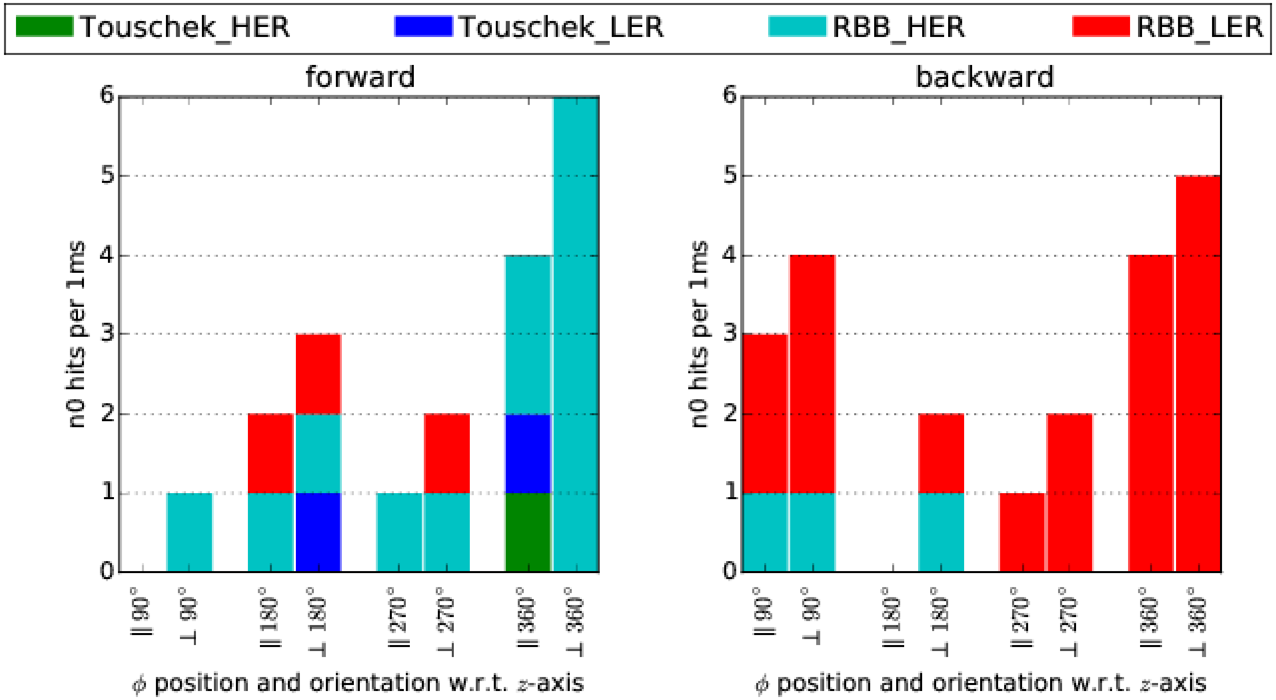
Combined Touschek+ Radiative Bhabha Backgrounds

Particle fluence (e^+) as a function of sensor position and orientation wrt to z-axis



Combined Touschek+ Radiative Bhabha Backgrounds

Particle fluence (n) as a function of sensor position and orientation wrt to z-axis



Thank you for your attention and enjoy the rest of the workshop!