Pisa SuperB Collaboration Meeting
Computing + Backgrounds Parallel session, Sep. 21th 2012

Summer 2012 Production

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Pisa SuperB Collaboration Meeting

Outline

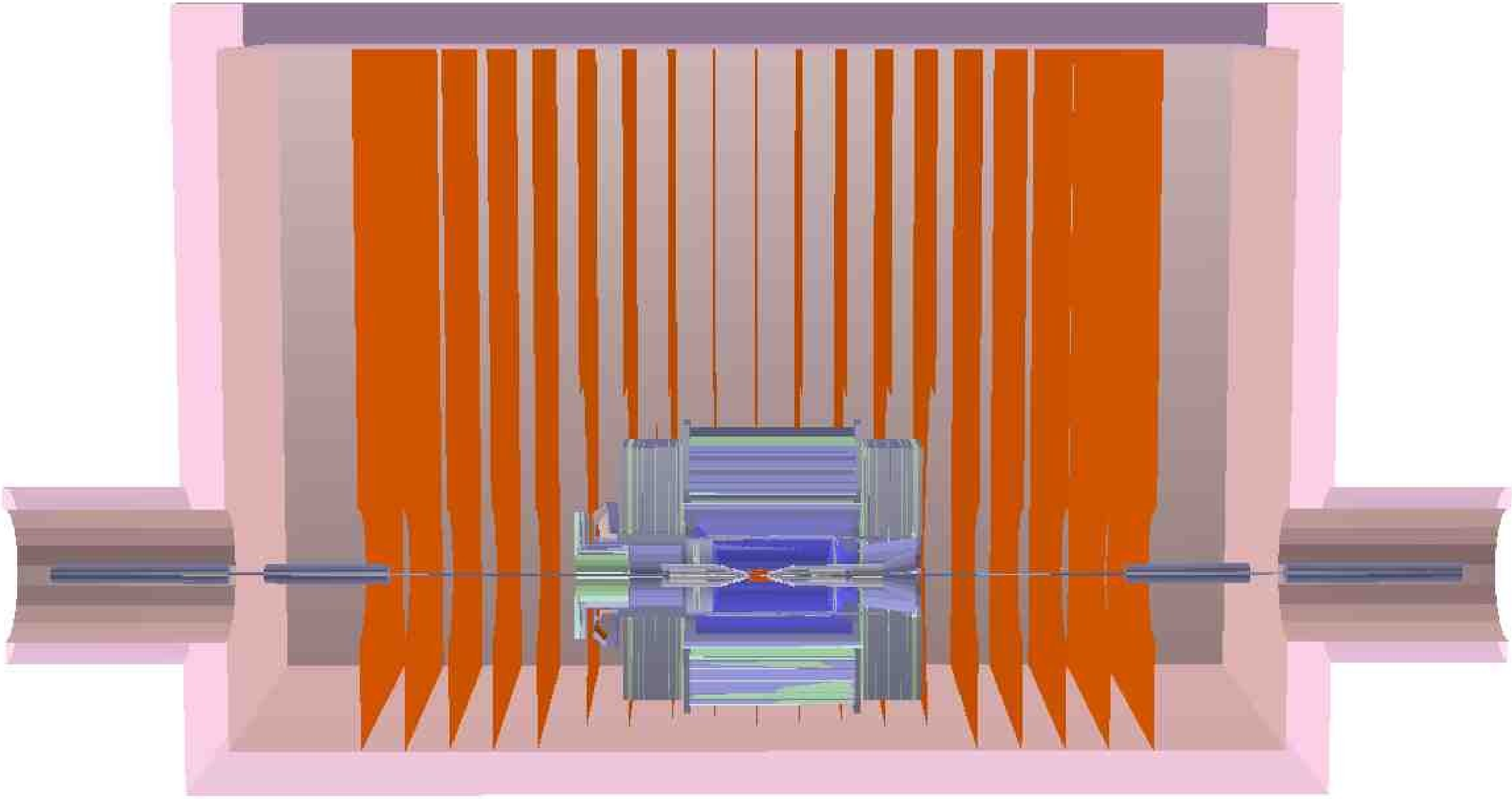
- **The new geometry**
- **The samples**
- **Summary**

A new default detector configuration for SuperB

- **Several improvements to the detector model where implemented for Summer-2012 production (Geometry_CABIBBO-V03)**
  - **Final focus:** more realistic W-shield compatible with space available and integration constrains. Conical shape of 3cm thick and cylindrical shape 4.5cm thick with increased external radius.
  - **SVT:** newest L0 model (F. Bosi). L1-5 model adapted to the SuperB angular coverage ($\pm$300 mrad)
  - **DCH:** Internal radius increased to make room for W-shield (237 $\rightarrow$ 265 mm); new foils of copper and Aluminium according to latest machanical drawings
  - **EMC:** Hybrid CsI-LYSO fwd-end-cap model and RadFET monitors
  - **IFR:** new iron/Boron-loaded-polyethylene shields
  - **Detector Hall:** more realistic model using Fabrizio Raffaeilli drawings
  - **Solenoidal detector field:** field was extending beyond the Super-conducting magnet volume and was not zero inside the FDIRC FBLOCK.
- **NOTE:** found a problem with FDIRC geometry related with the MaPMT photocathode using BK7. The problem was fixed (changing material to Aluminium) and committed but not in time for Summer-2012 production. Summer-2012 samples are still usable applying a post-production patch. New production will be run if needed.

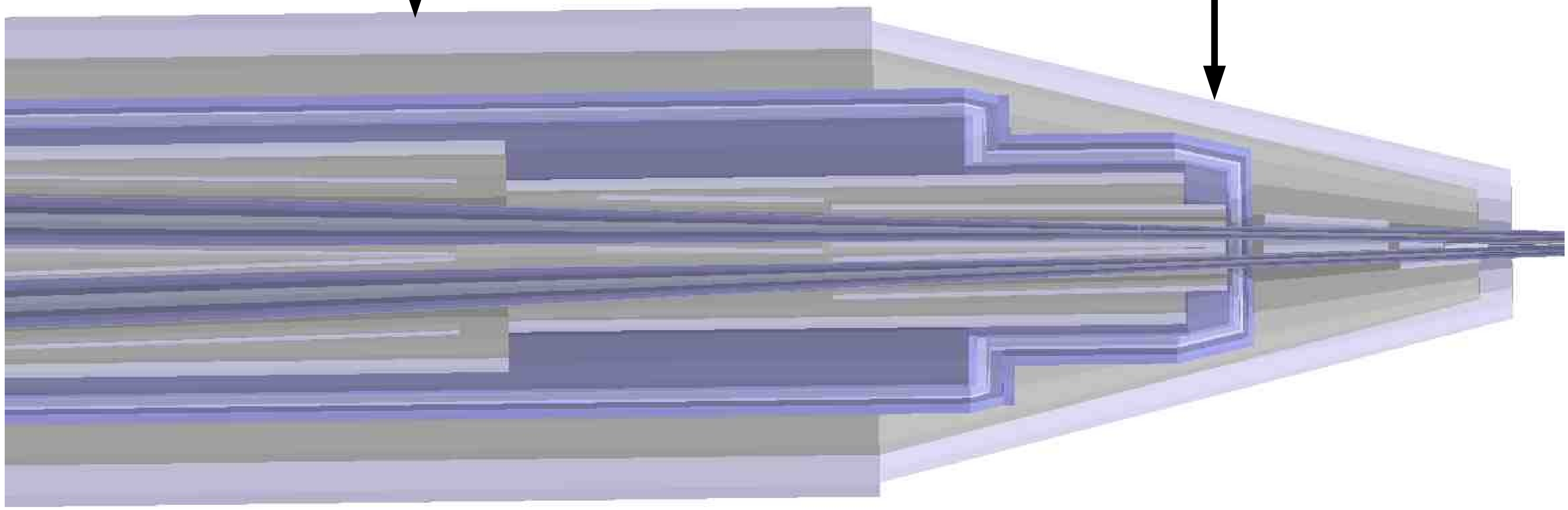
New geometry: Detector Hall Model

- More realistic model of the detector hall following Fabrizio Raffaelli
- Better estimation of the neutron cloud



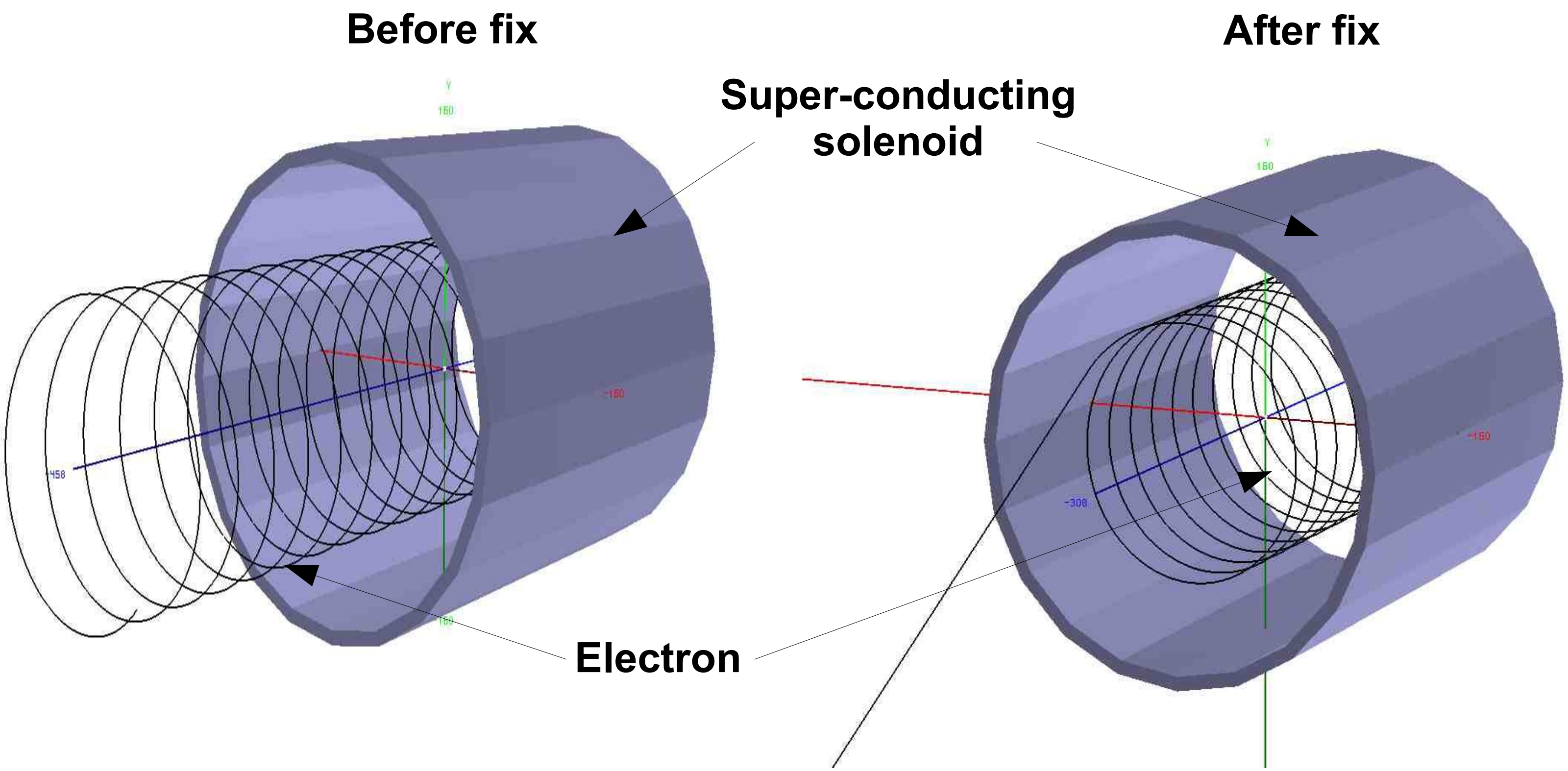
New geometry: Tungsten Shield

- **Conical section 3cm thick**
- **Cylindrical section 4.5cm thick**



New geometry: Detector solenoidal field

- **Solenoidal field was extending outside the super-conducting magnet cylinder. This has been fixed**



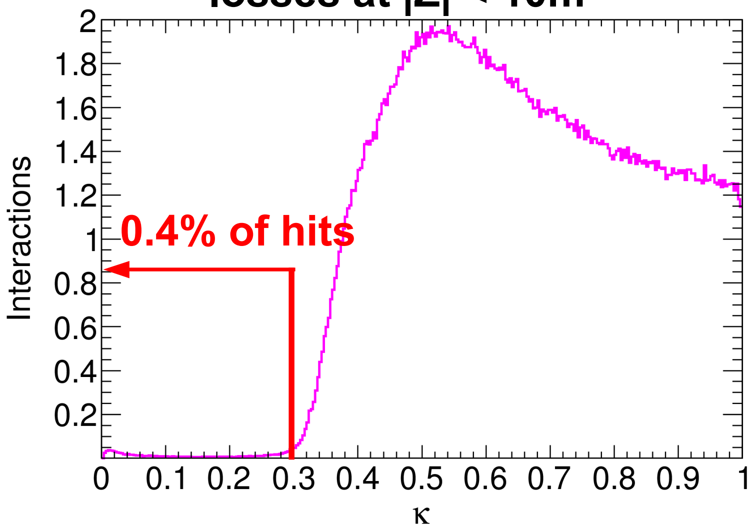
The machine background model

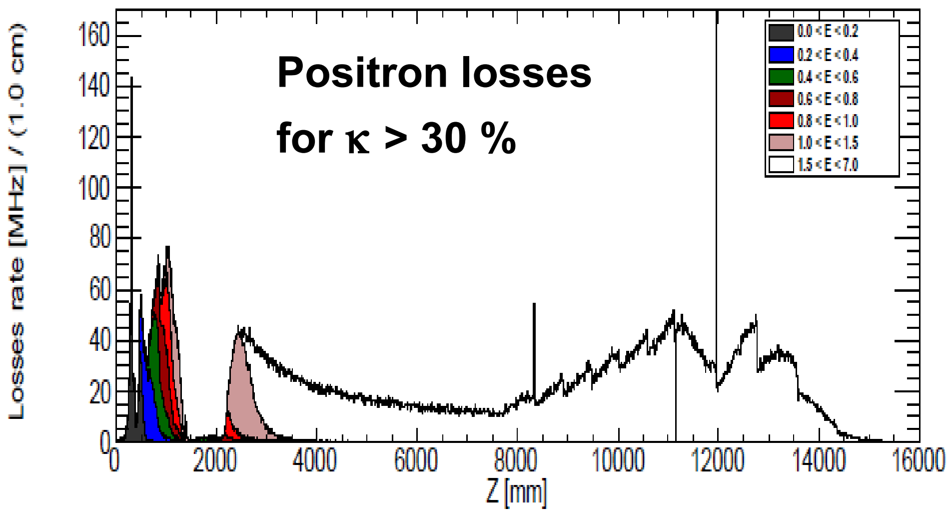
- **We are continuously our background model. The usual samples have been studied**
  - High-κ Rad-Bhabha (κ > 30%). This is the main Rad-bhabha component giving backgrounds on the detector.
    - Geometry_CABIBBO-V03/Geometry_CABIBBO-V03_LYSO: 15k/12k bunch-crossings (BC)
  - Pairs (Geometry_CABIBBO-V03): 100k BC
  - Touschek HER/LER: 88k/198k primaries
  - Beam-Gas HER/LER: 185k/283k primaries
- **In this cycle we also produced for the first time two other background sources (Geometry_CABIBBO-V03)**
  - Low-κ Rad-Bhabha (0.5 < κ < 30%): 20k BC
    - Models a significant fraction of the total Rad-bhabha losses for |Z| > 10m (first downstream dipoles)
    - These losses can contribute significantly to the neutron cloud build up process
  - Synchrotron Radiation (SR) HER/LER: 10k/10k BC
- **Note: the primaries used for Pairs, Tousche and Beam-Gas are the same as in previous productions**

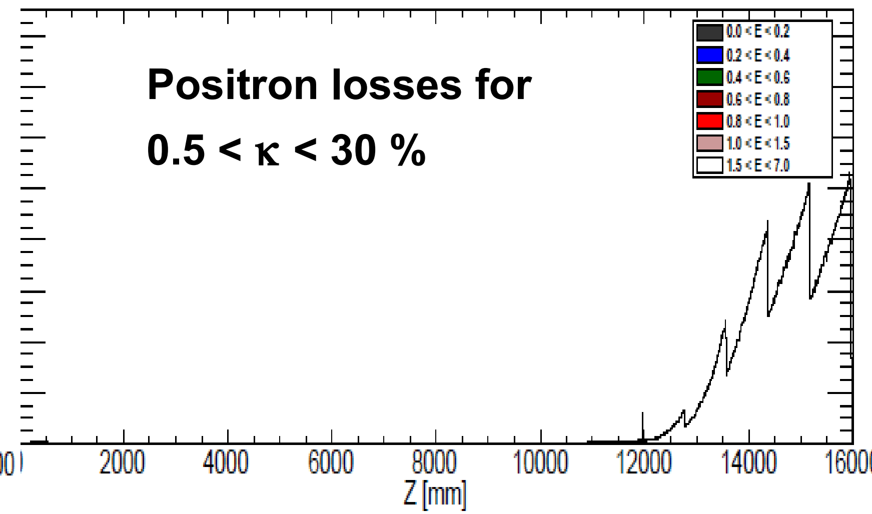
The machine background model: low κ Rad-Bhabha

- **κ > 30% gives the main component of Rad-bhabha losses for |Z| < 10m (hits with κ > 30% are ~0.4% of total).**
- Photons and leptons for from Rad-bhabha with 0.5 < κ < 30% can hit the beam pipe at the far dipoles (|Z| > 10m) and contribute to the neutron cloud
- Expect only non-negligible contributions on the IFR and on the Detector hall transmission lines

κ distribution for lepton losses at |Z| < 10m

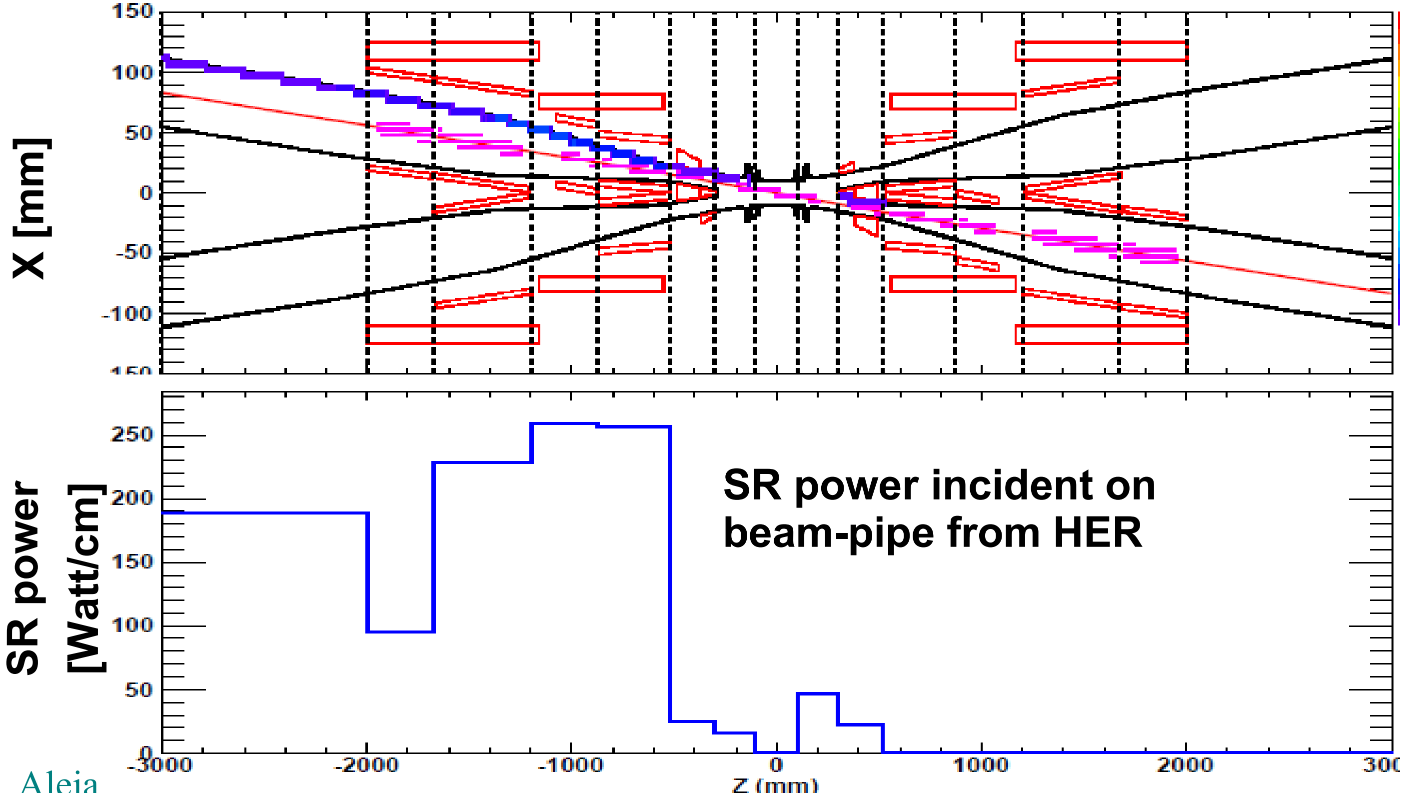


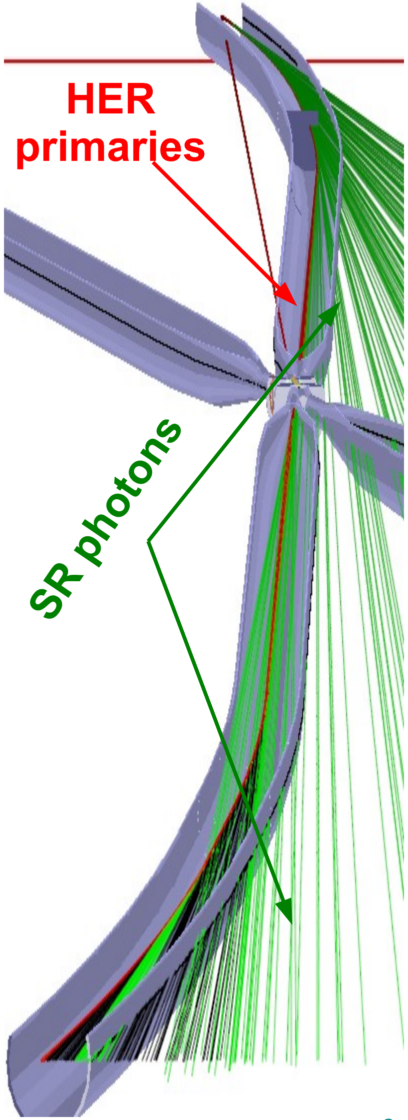




The machine background model: Synchrotron Radiation

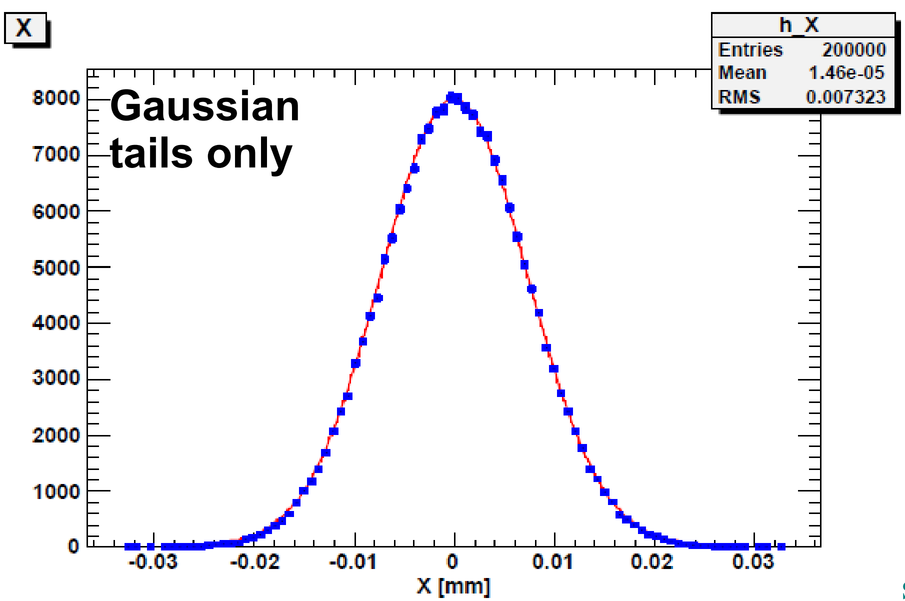
- SR energy spectrum is the soft X-ray, but the rates are huge (hundreds of watts)
- The final focus W-shield should be more than adequate to absorb SR-photons passing through the thin beam-pipe
- The small fraction of the SR radiation that will be reflected and diffused by the inner surface of the pipe eventually hitting the SVT will be evaluated with Bruno

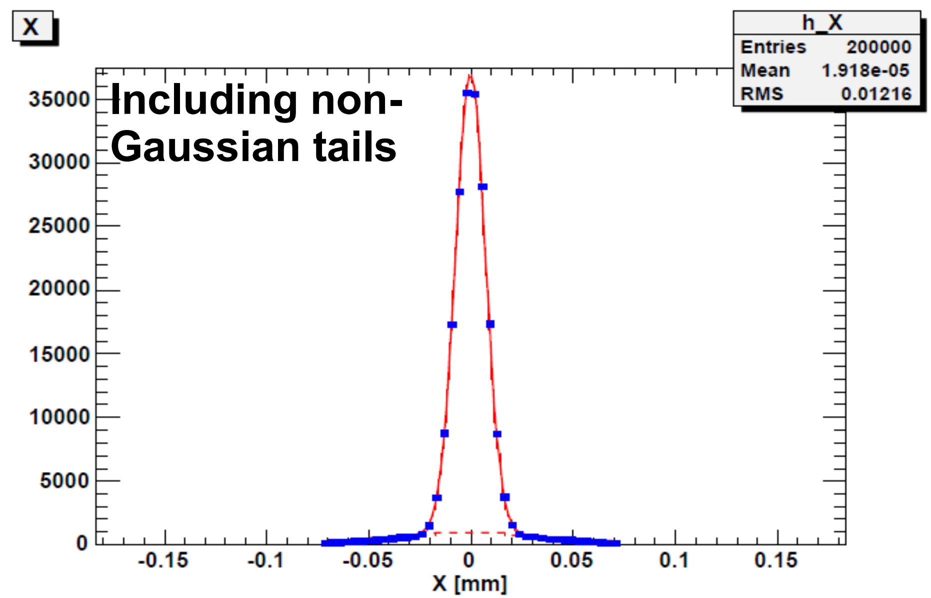




Synchrotron Radiation: strategy

- **3 stages code:**
  - Stage 1: use the IP parameters of the beams to generate primaries for HER/LER. Invert momentum and charge and backtrack particles up to the 2nd dipoles upstream the beam-line
  - Stage 2: at this point re-invert the momentum and charge and foward-track the particles turning-on the Synchrotron radiation
  - Stage 3: use as primaries for the simulation those photons that eventually hit the beam pipe
- **Can include non-gaussian tails from Touschek/Beam-Gas by adding 2 gaussian functions: core + tails. Can also move the location of the IP**
- **Summer 2012 production used gaussian tails only**





Summary

- **A very complete set of background samples have been analysed**
  - Rad-bhabha (low and high κ)
  - Pairs
  - Touschek and BeamGas (HER/LER)
  - Synchrotron Radiation (HER/LER)
- **Outlook:**
  - SR with non-gaussian tails using the latest estimation from Manuela Boscolo

Many thanks to the Computing team that made this fullsim production possible with their hard work during the during the holidays

- A. Fella

- C. De Santis

- M. Manzali

Backup