Assembling Background Frames

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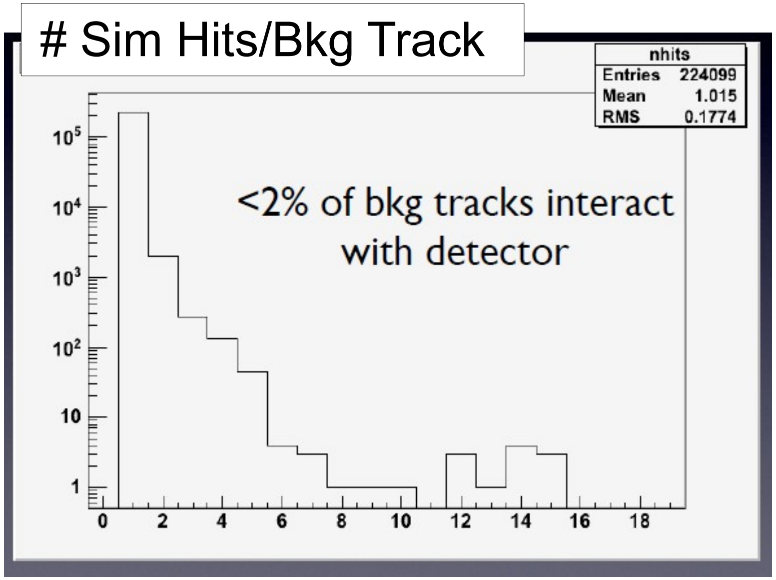
General Idea

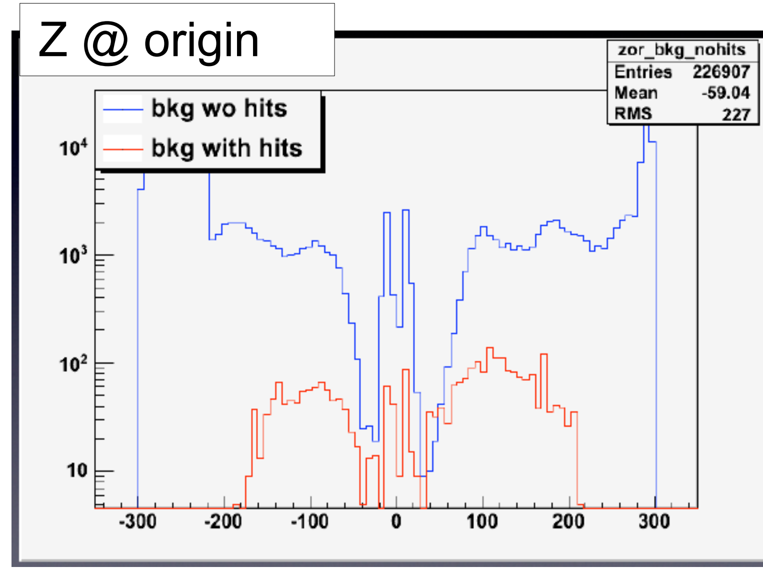
- Simulate accelerator backgrounds using specific tool for each process
- Simulate details of the interaction with the material using GEANT4 description of the detector and the accelerator elements
- Pass a limited set of information to the fast-sim to finalize the simulation and merge the result with the simulation of a physics event
  - TParticles, energy deposits, fluences

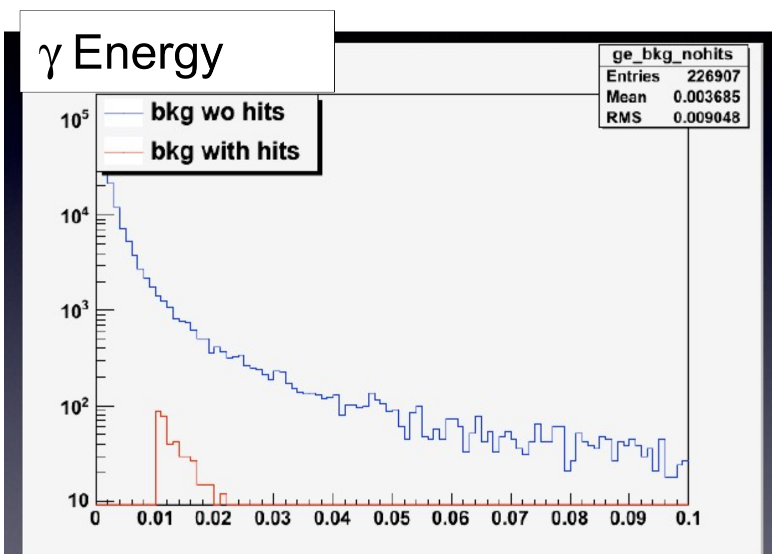
General Idea

- Background level proportional to time window (w) where detectors are sensitive to accelerator backgrounds
- expect simulation to produce background information “per bunch crossing”
- Embed N bunch crossing for each physics event
  - $N=w*\nu$ [= 1μs*400MHz = 400]
  - ν=bunch crossing frequency
  - ν and w configurable
- w=1μs, driven by DCH, subdetectors can specify a smaller window

γ and high Pt tracks: selection



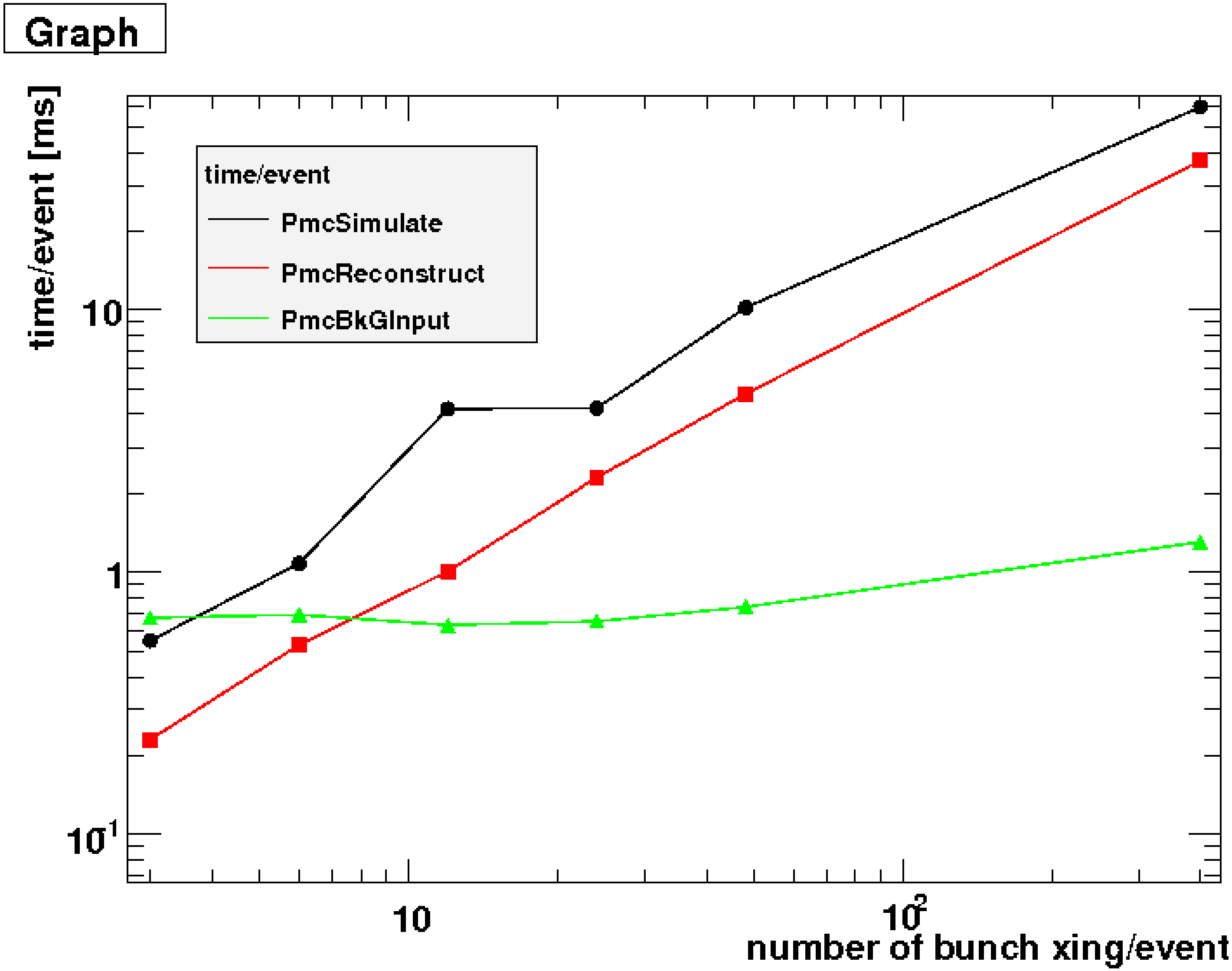




- -200 cm < Z < 250 cm
- Eγ>8MeV

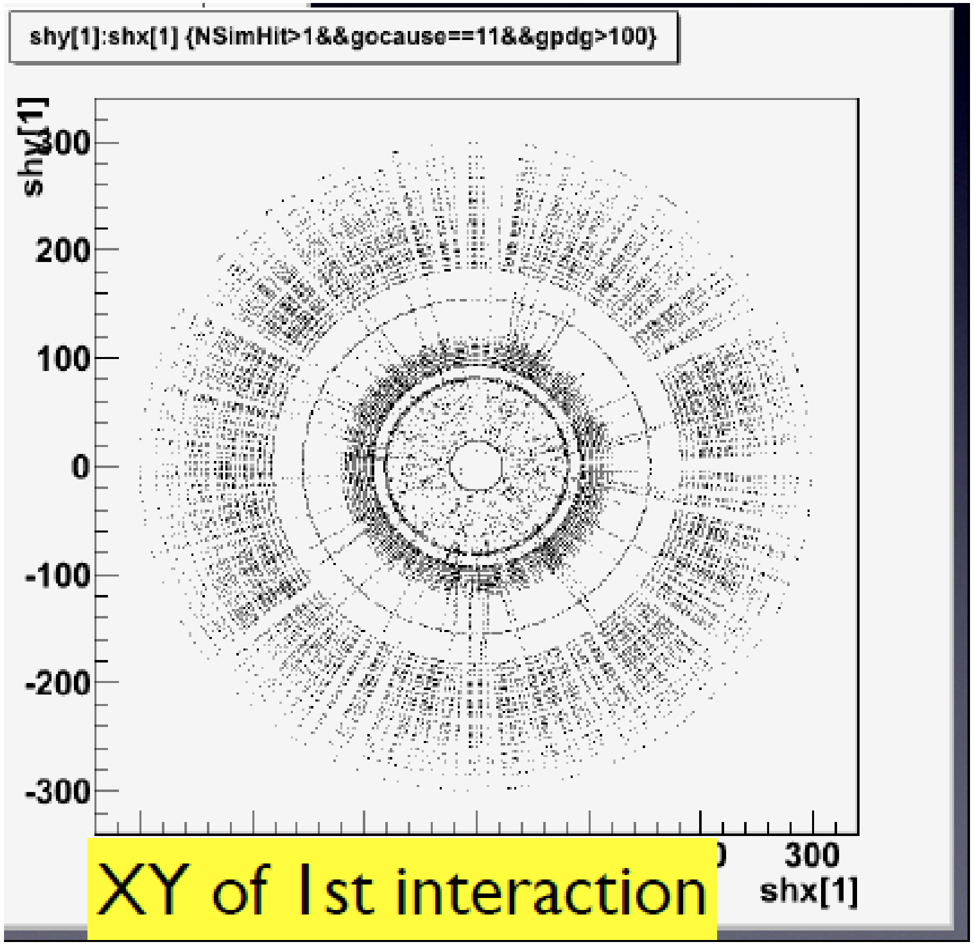
Beam strahlung: CPU Usage

- SumTimeAction
- Log-log scale
- PmcBkgInput ~constant time
- PmcSimulate & PmcReconstruct proportional to number of bunch xing in window
- PmcSimulate~60 ms/event



Neutron interactions

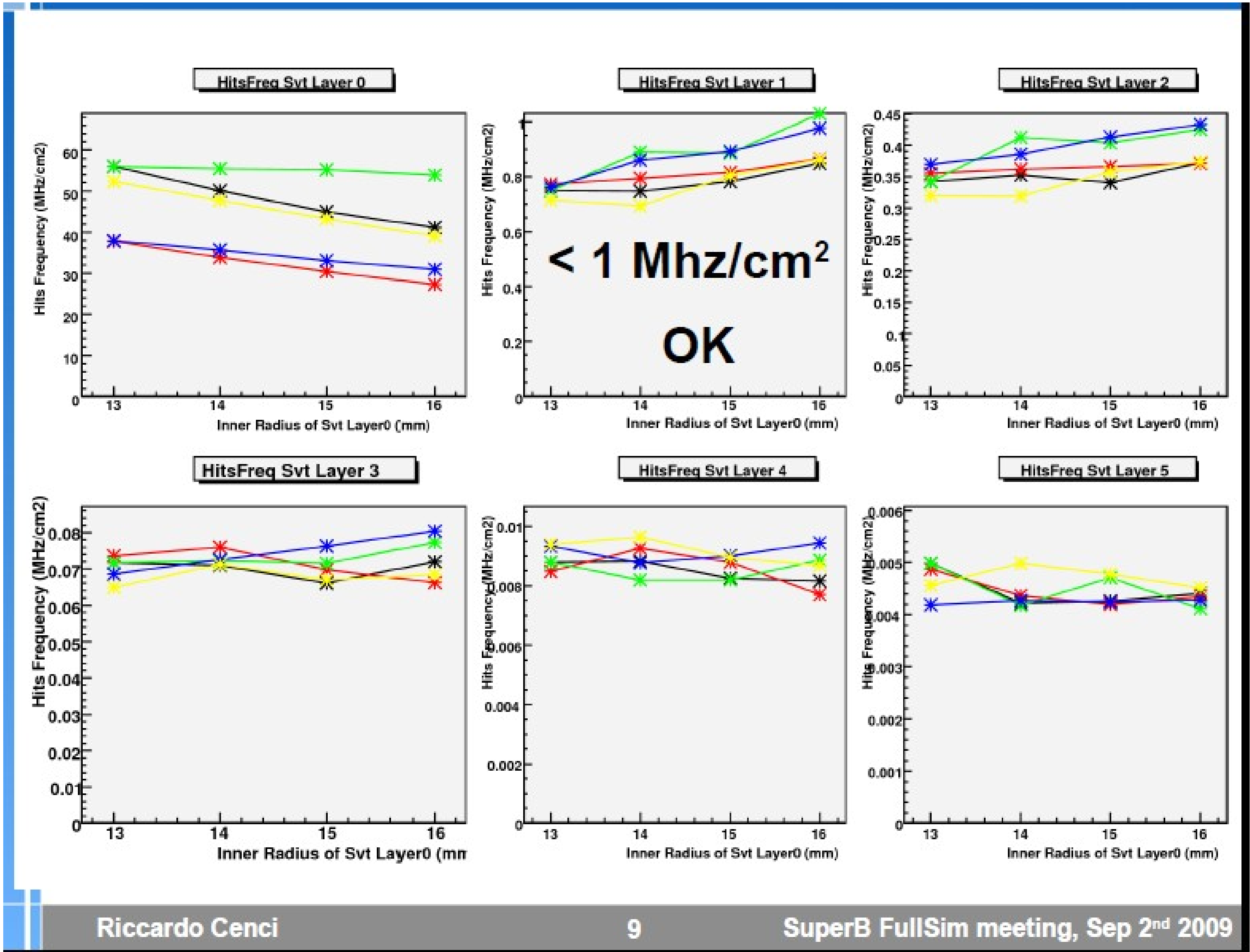
- 90% of remaining particles interacting with detector are neutrons
- => do not simulate neutron passage
- Simply add the location of the energy deposit as a TParticles with a specific origin code?
  - No need for a specific input module in fast sim



R. Cenci

Low Pt particles

- Fluences from full sim
- Only pair production considered
- Toushek ?
- Can be implemented as a lookup table
- Generate random hits according to table



Types of Input Information: summary

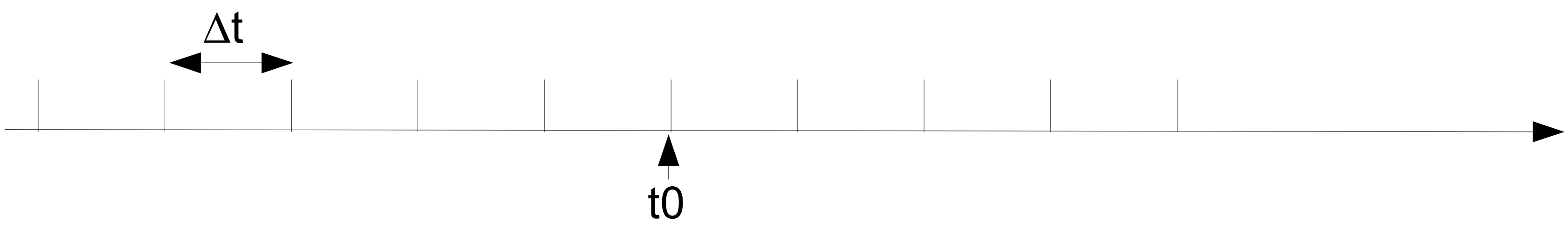
- γ and high Pt tracks
  - TParticle
    - Save position and momentum of particles exiting a scoring volume, convert them into GTracks and simulate their passage trough the Fast-Sim detector
- Neutrons in EMC and IFR
  - Energy deposit
    - Use EMC and IFR response to determine the fast sim hits
- Low Pt tracks and neutrons in Tracking volume
  - Fluence
    - Generate random hits according to fluence

TParticle Input

- Use single clonable module to read different types of input
- 1GB file limit => split bkg files (background set) and read each one in sequence
- Start event can be configured in the job or be random => helps to increase randomization when re-using background files
- New selection of input TParticles

Time distribution

- Divide background sources in
  - Synchronous with bunch crossing
    - Bhabha, pair production
      - $t_0=0$, $\Delta t=2.5$ns
  - Asynchronous and single beam
    - Non Gaussian tails, Touschek, beam-gas, synchrotron radiation
      - t=random
      - uniformly distributed in [-w/2,+w/2]



Summary & Discussion

- TParticle Input: OK
- Energy deposit:
  - Simply add the location of the energy deposit as a TParticles with a specific origin code?
    - No need for a specific input module in fast sim
- Fluences:
  - Lookup table?
    - Generate random hits according to table