

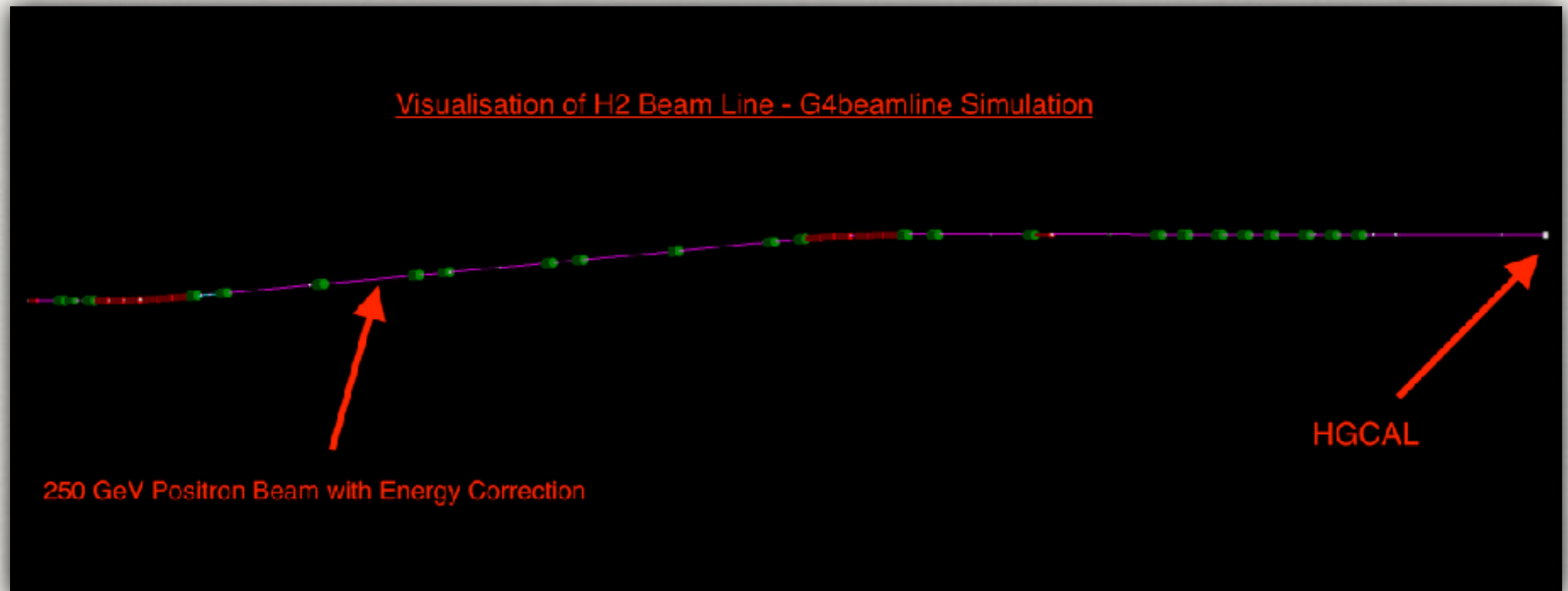
# SPS-H2 ENERGY LOSS AND MATERIAL IMPACT @HGICAL BEAM TEST

- After October test beam, HGICAL team would like to understand better about energy loss (especially for electron beam)
- Possible sources of energy loss;
  - Synchrotron Radiation (SR)
  - Beam-line material impact (next steps); bending magnets, quadrupoles, collimators, beam windows, out-of-vacuum conditions, NA61 experiment etc.



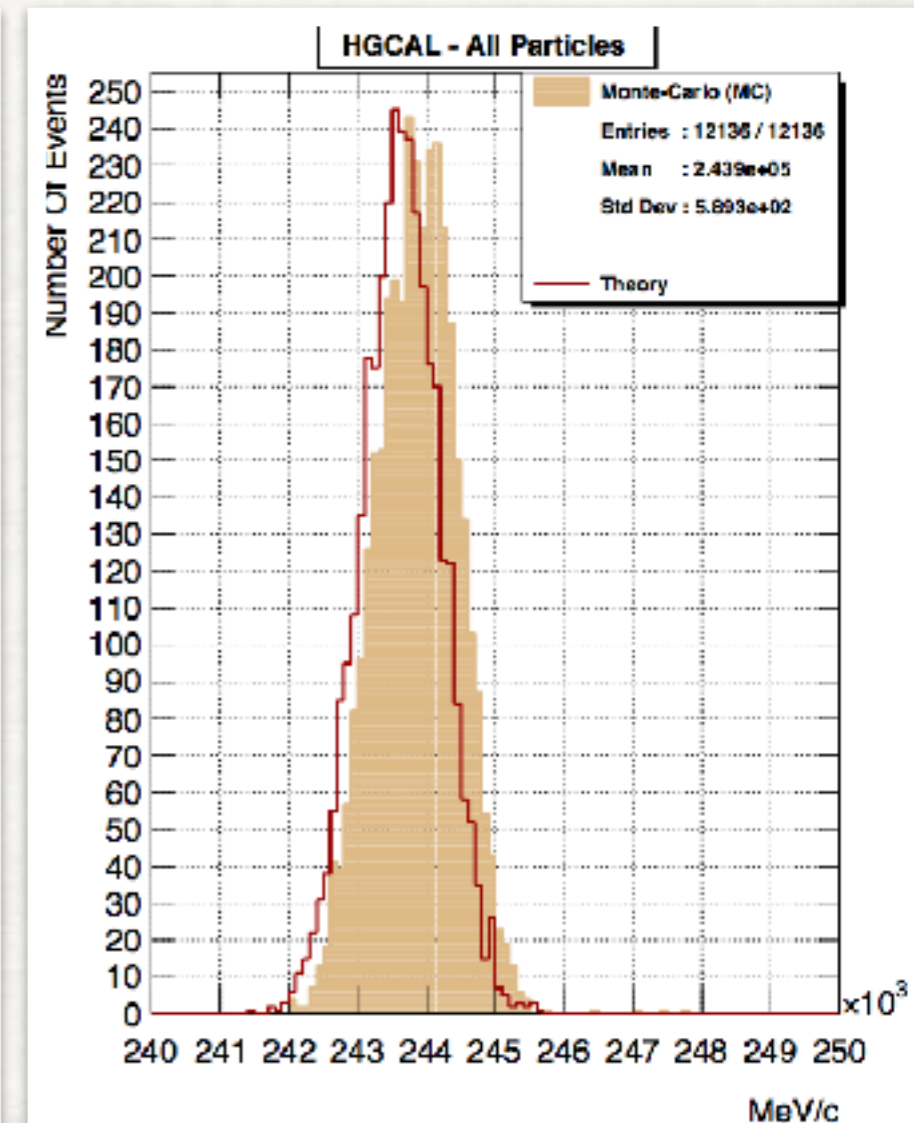
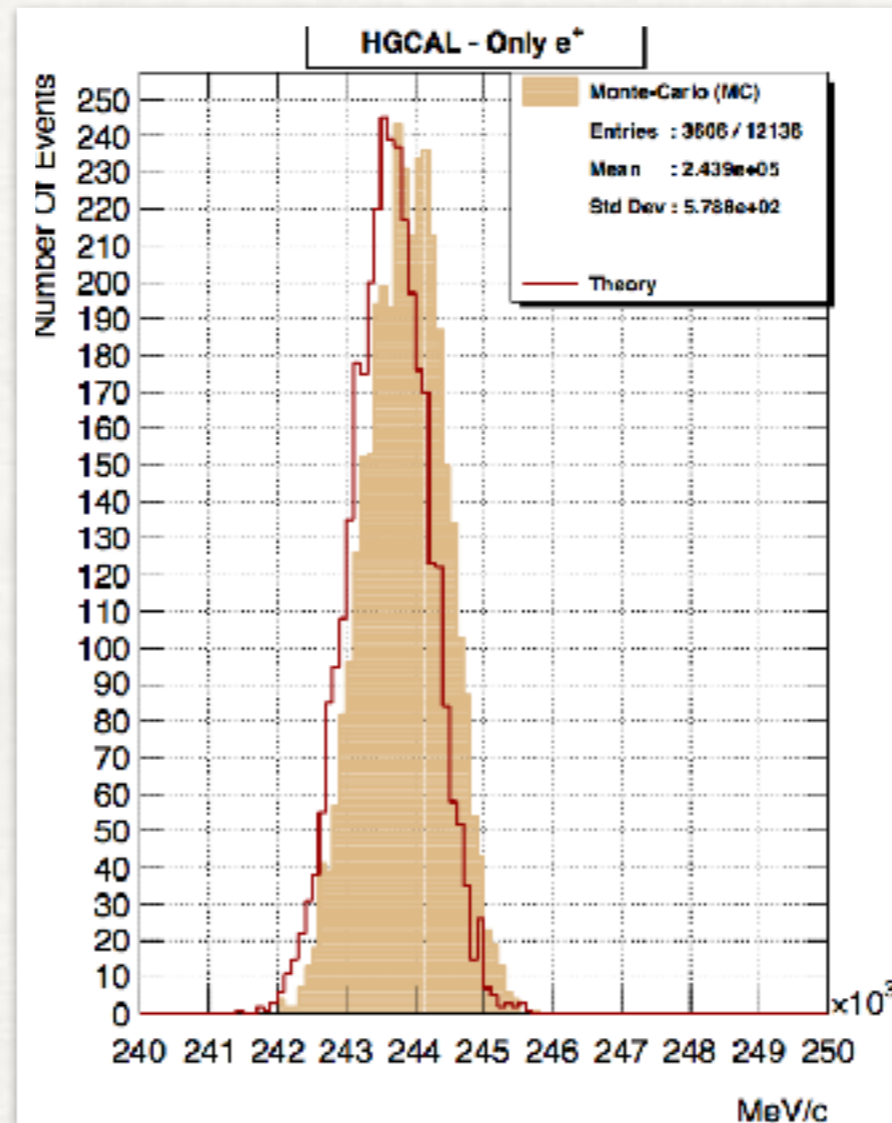
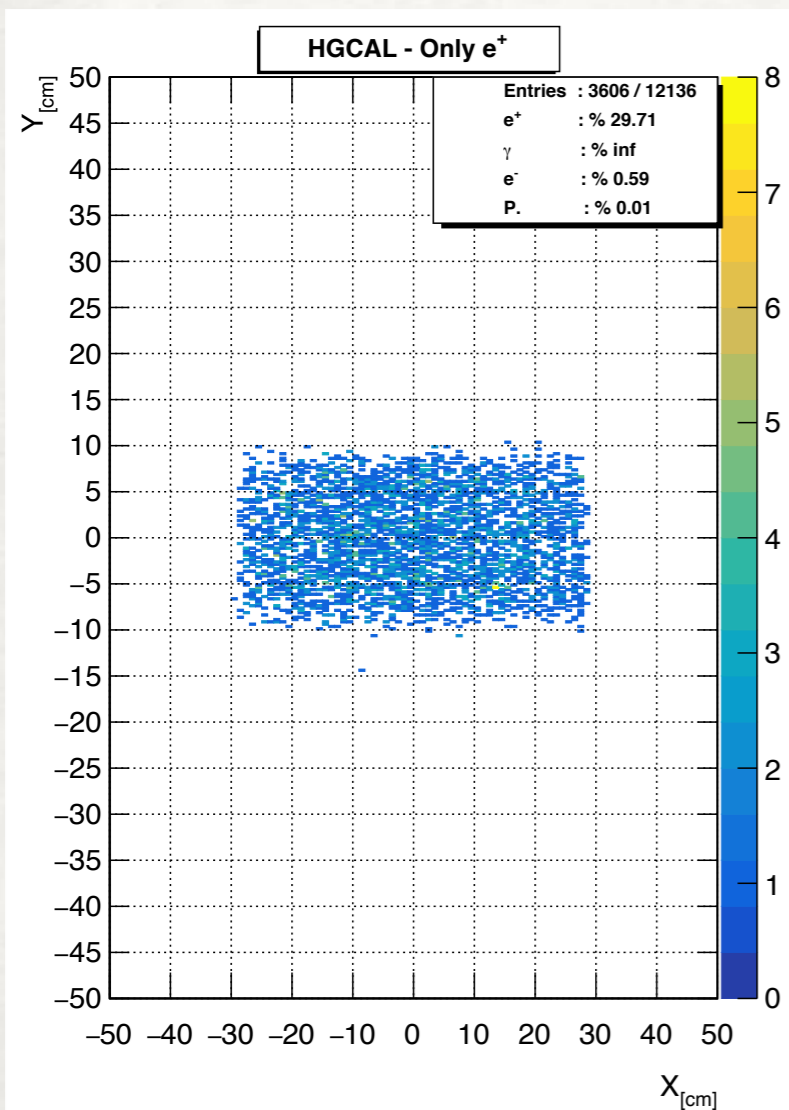
# SPS-H2 ENERGY LOSS AND MATERIAL IMPACT @HGICAL BEAM TEST

- A detailed G4beamline model is tuned to transfer energy-corrected electrons in a quote realistic way: Correct beam optics & collimator settings included in the MC.
- Synchrotron Radiation (SR) effects caused by bending magnets are considered and being investigated in detail



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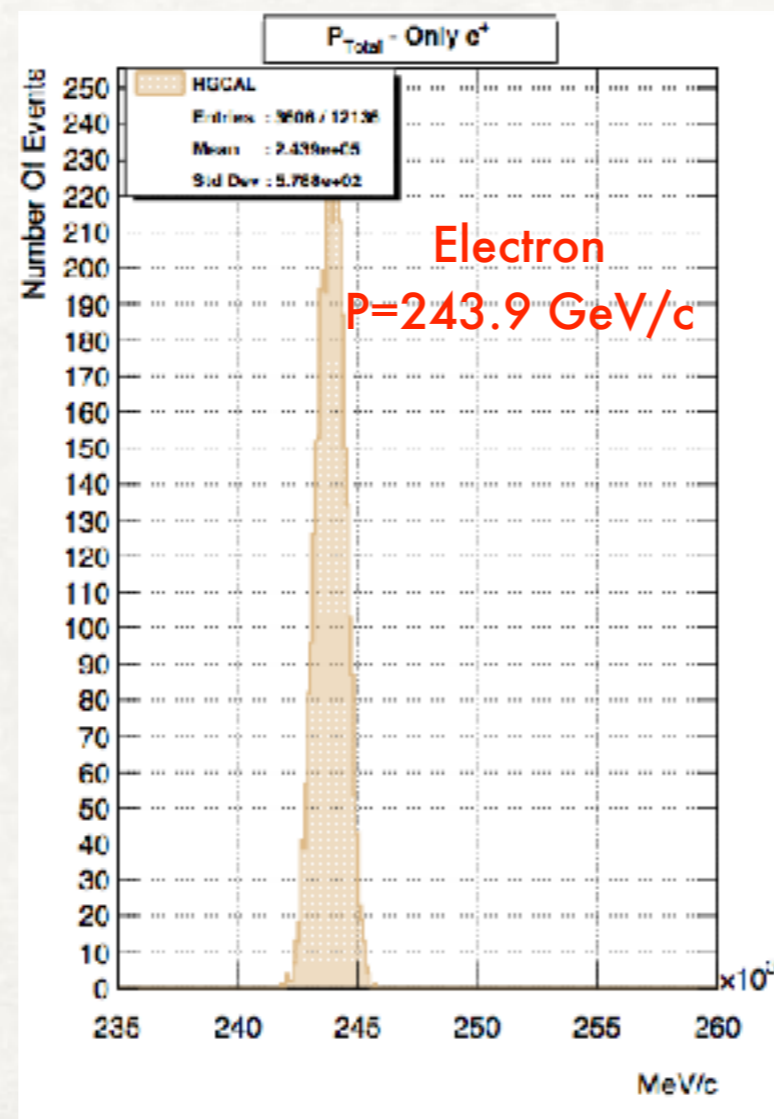
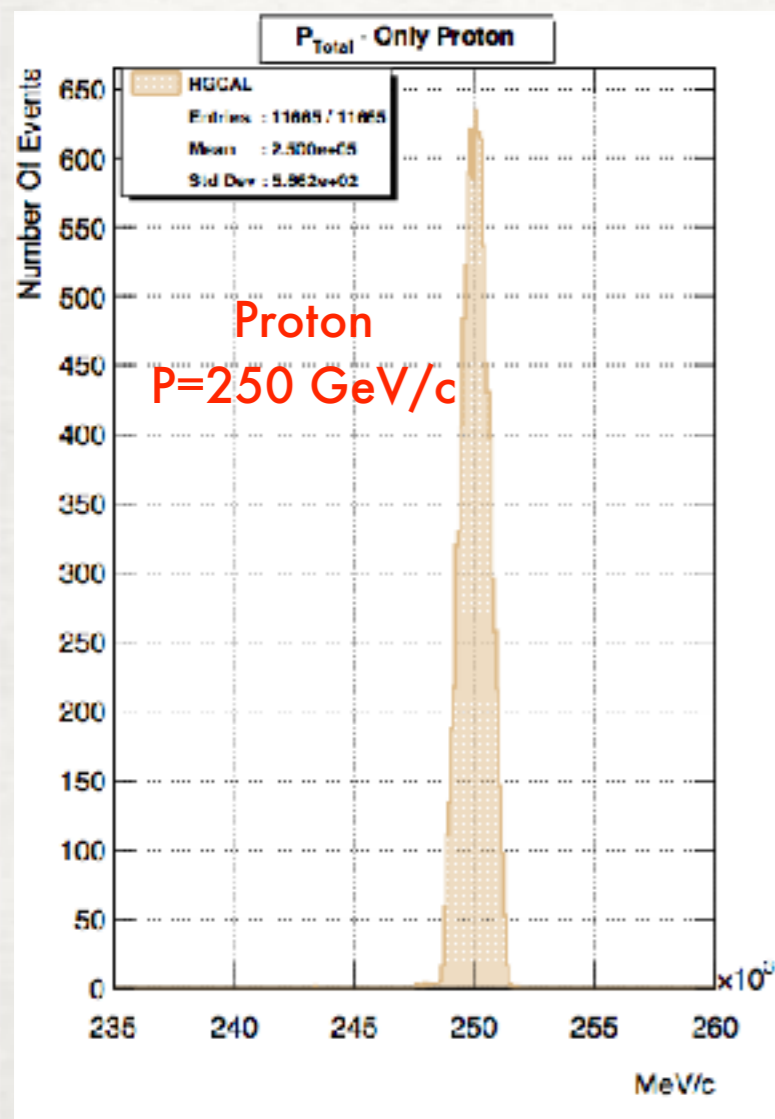
- Left plot shows beam profile of 250 GeV/c positron (90%), proton (10%) example beam with realistic settings @HGICAL
- Middle and right plot shows that theory and sim coherent



# SPS-H2 ENERGY LOSS AND MATERIAL IMPACT @HGICAL BEAM TEST

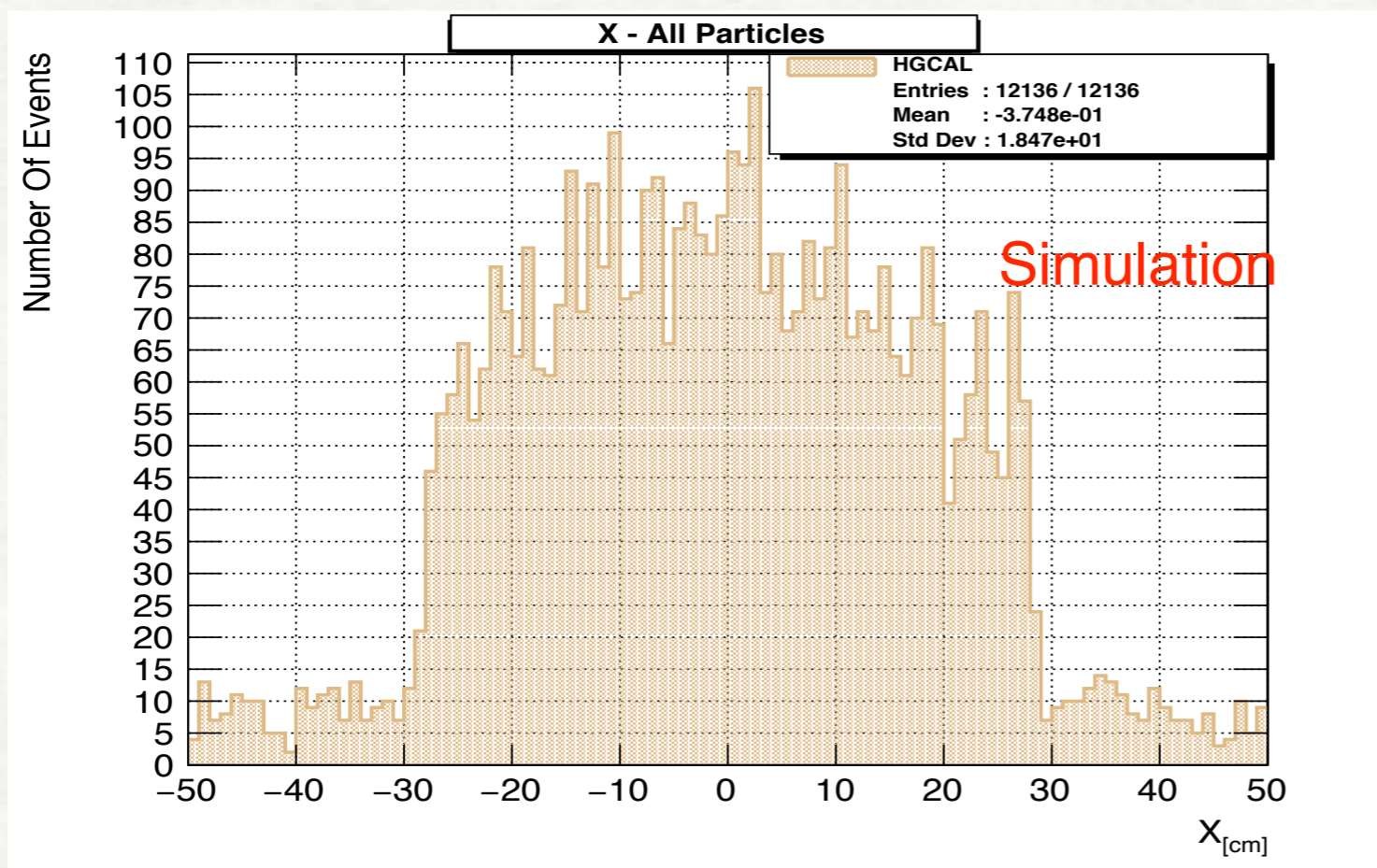
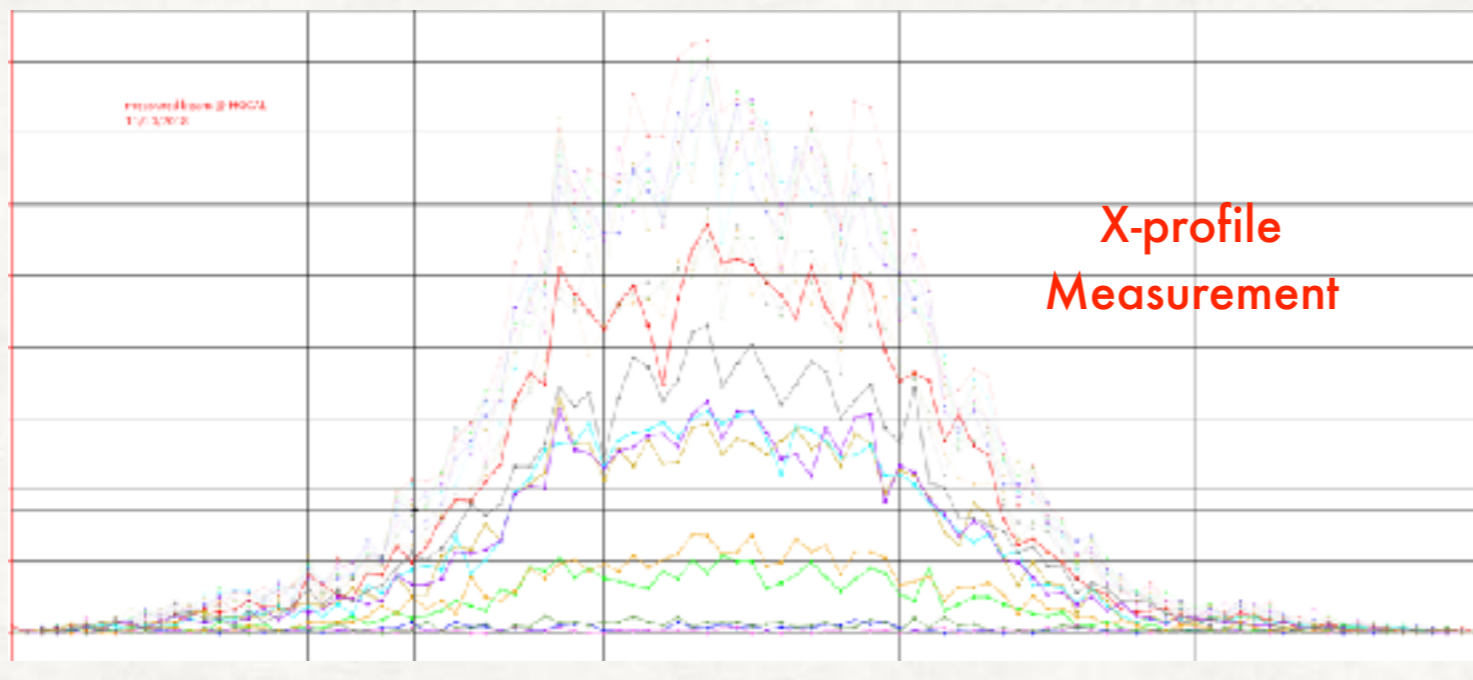
## SR has important effect on the beam

- First simulations performed with existing model ▶ being updated with more details.
- SR effects correctly reproduce with theoretical calculations;  $\Delta E = \sim 6.1 \text{ GeV}/c \pm \sim 2\%$ .



- SR has also effects on the momentum resolution ("definition") by the beam line spectrometer ▶ effect being investigated
- Multiple scattering of electrons in material upstream the test-beam zone could be important ▶ Investigation on going

# SPS-H2 ENERGY LOSS AND MATERIAL IMPACT @HGICAL BEAM TEST



- Preliminary results show good agreement.
- Next steps will be more detailed investigation of the beam line; materials, unexpected irregularities etc.
- Final step: comparison of simulation with detector data.

# SPS-H2 ENERGY LOSS AND MATERIAL IMPACT @HGICAL BEAM TEST

## Summary and Next Steps

- G4beamline simulation and theory are coherent
- Measurement/MC comparison after more realistic simulation
- Within next week, planing to investigate beam line;
  - Beam windows, scintillators (triggers), possible materials which is not in the input file, places that beam passing trough the air etc.
- After perfection of simulation, it'll be run with the different energy values (20, 30, 50, 80, 100, 120, 150, 200, 250, 300 GeV/c)