# Comparison ICOSIM loss maps with SIXTRACK and measurements (ongoing study)

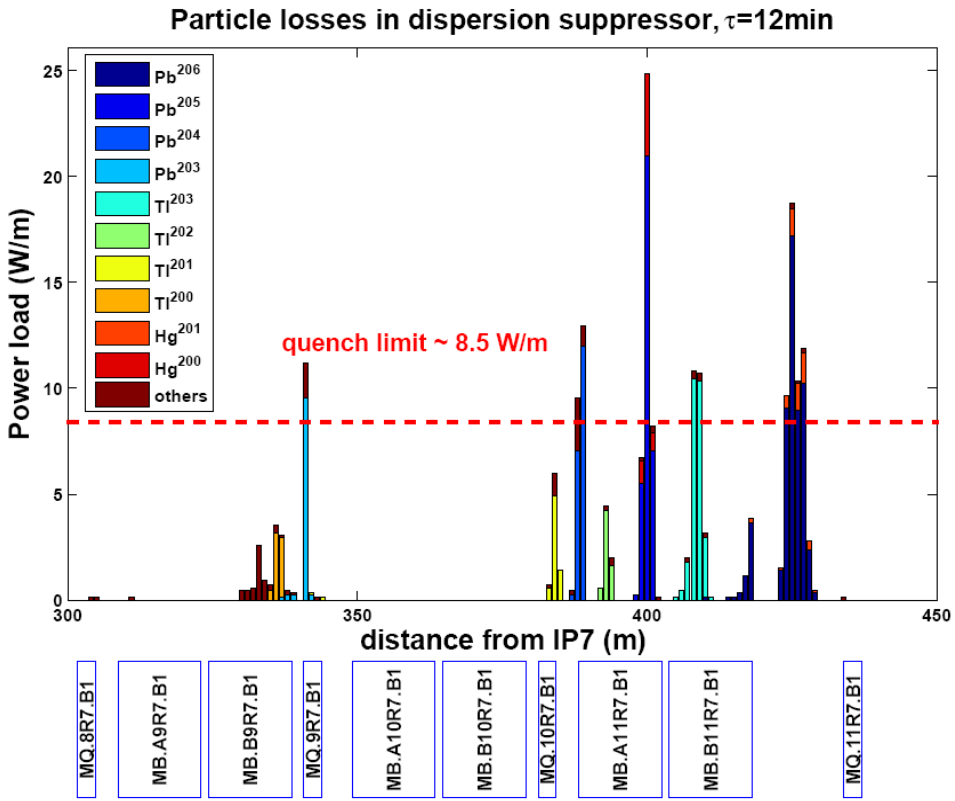
R. Bruce, S. Gilardoni, J. M. Jowett

# Motivation

- ICOSIM code used to calculate heavy ion collimation loss maps for the LHC (H. Braun, G. Bellodi)

- The 2004 SPS collimator experiment gives an opportunity to crosscheck this code against experimental data

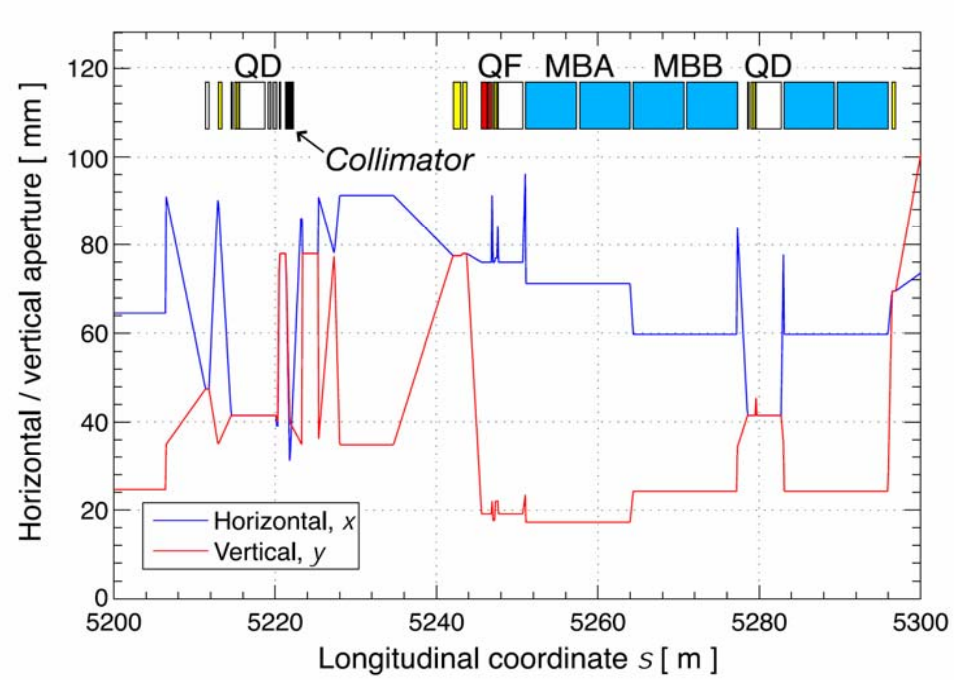
# The ICOSIM code

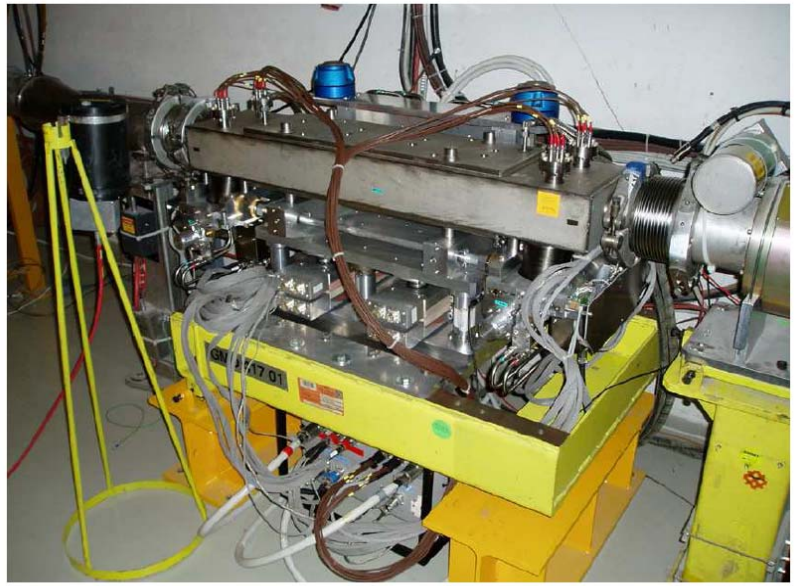



*(H. Braun, G. Bellodi)*

- Tracking (linear + chromatic effects) of ions in the LHC lattice
- Continous blowup of the envelope induces losses
- Passage through collimators modeled for Pb ions through Monte Carlo simulation:
  - Bethe-Bloch
  - Multiple scattering
  - Hadronic fragmentation and electromagnetic dissociation (cross sections from I. Psenischnov)
- All fragments tracked until they are lost, loss positions recorded

# The 2004 SPS experiment



*(from S. Redaelli et al)*

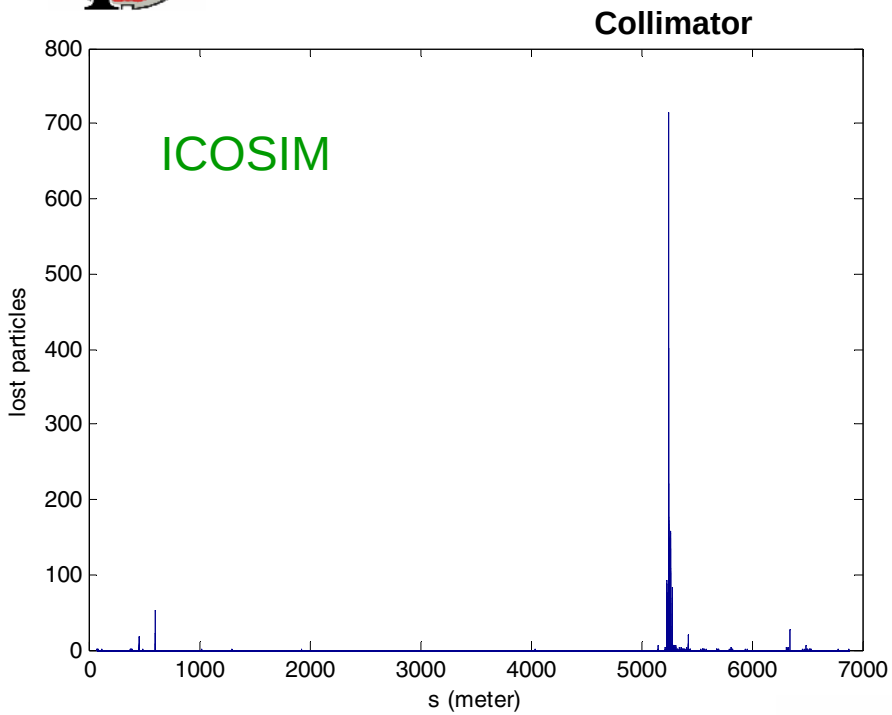
- LHC secondary collimator prototype installed in SPS lattice
- Jaws moved in and out during 270 GeV proton operation
- BLM signals recorded from all 216 monitors in the ring
- Not meant to be a benchmark test of loss map simulation from the beginning, therefore data analysis cumbersome
- Off-line data analysis and SIXTRACK simulation by S. Redaelli et al

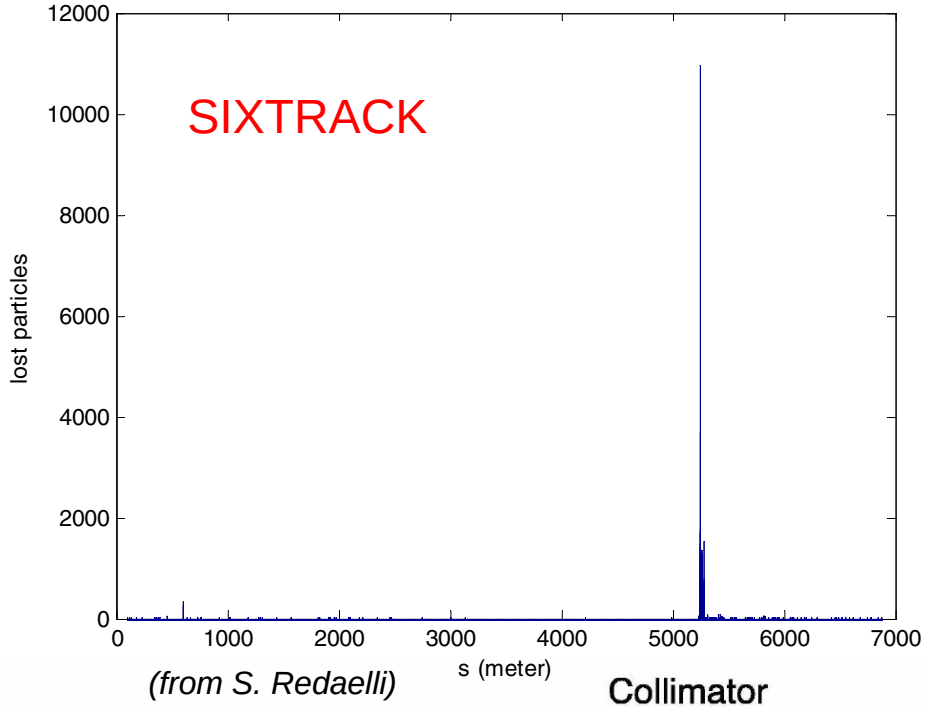
# Modifications of ICOSIM

- SPS-optics and 270 GeV proton beam instead of LHC ions (easy)
- Changed to include rectangular apertures
- Proton physics when particles pass collimator (more tricky).

  Easiest solution: MARS called every time the particles pass the collimator. Scattered particles are injected back into the ICOSIM tracking.

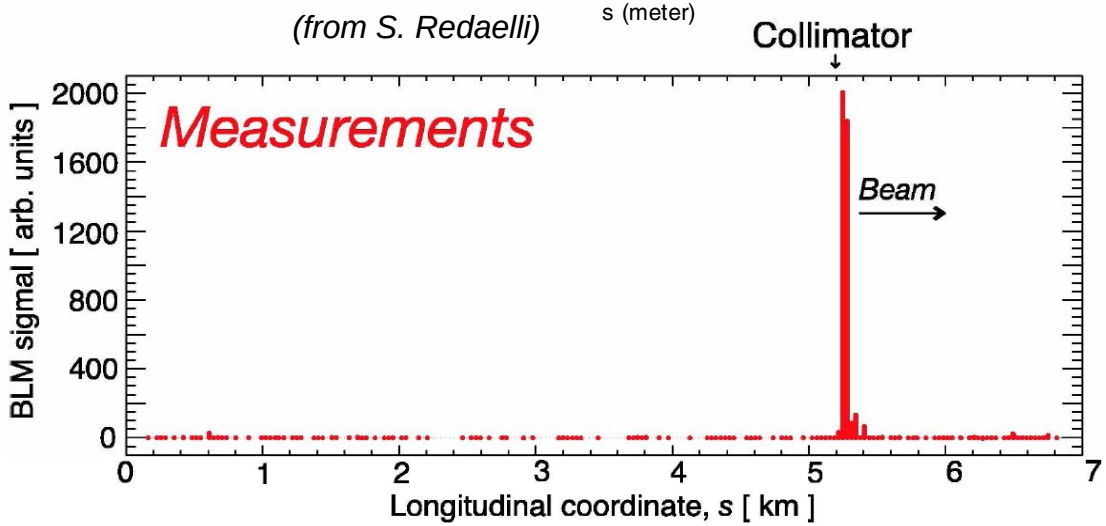
# Comparison (ongoing study)



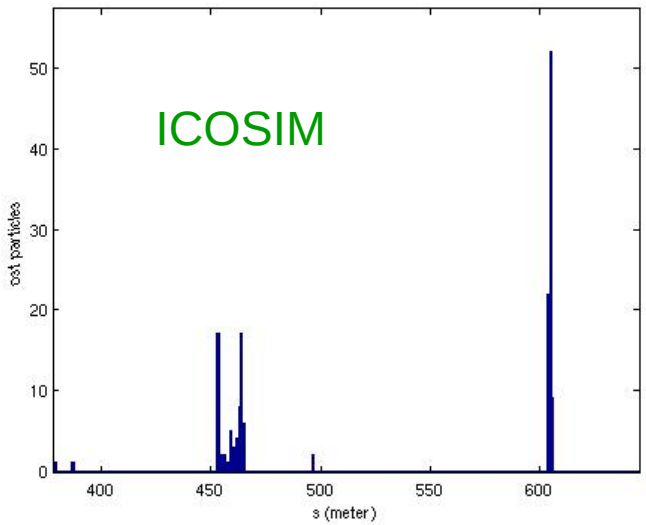

*(from S. Redaelli)*

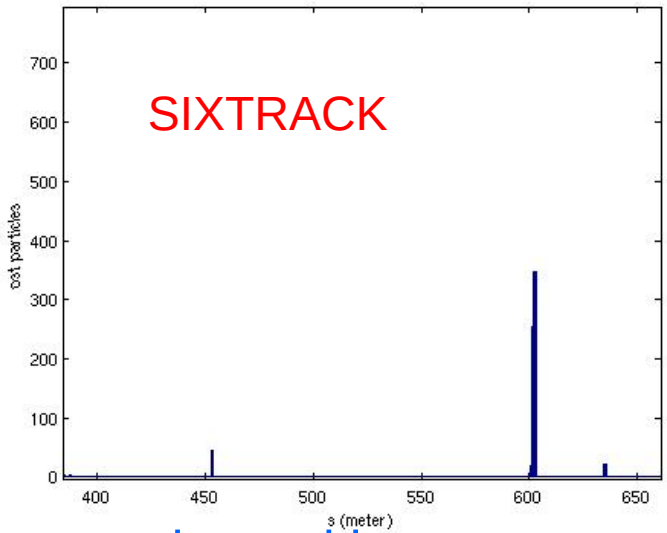
Simulation results plotted with 1 m binning



# Results

- Qualitatively very good agreement.
- Particles lost outside collimators: 12.0 % (ICOSIM), 8.7 % (SIXTRACK) – needs to be checked with Stefano
- Ratio between the two highest peaks agree within a factor 2 between simulation codes - dependent on binning.
- Smaller peaks and “grass” different.




- BLM placement complicates comparison with measurements
- So far no quantitative comparison between the height of the peaks, since the transfer function between lost particles and BLM signal is not known.

# Future work

- FLUKA simulation of the shower induced by the lost particles at the highest peak => estimate of the expected BLM signal that can be compared to measurements.
  Will increase the quality of both ICOSIM and SIXTRACK benchmarks.

- New experiment underway => More (better?) data to compare with

# Conclusions

- There is a good overall agreement in the loss maps between both ICOSIM, SIXTRACK and data.
- However, smaller discrepancies at less frequent loss positions
- More work needs to be done to quantify the comparison.