Touschek generator un-biasing

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11 May 2010

Workflow of the simulation

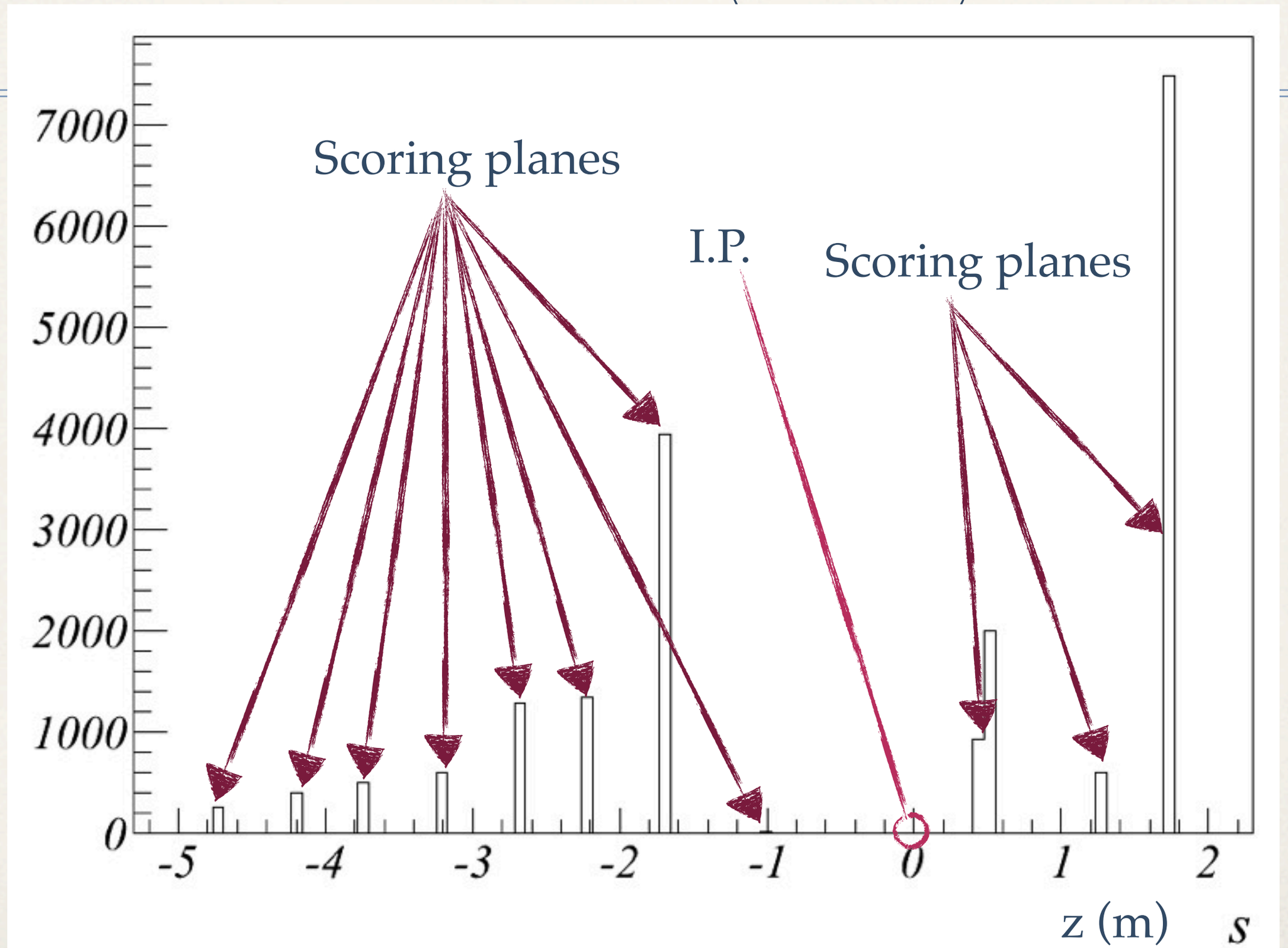
- Description of the Manuela's simulation output (Side M)
- Description of the fast simulation needs & requirements (Side F)
- Cross checks that my understanding fit on both side of the problem

Toushek Background Primaries

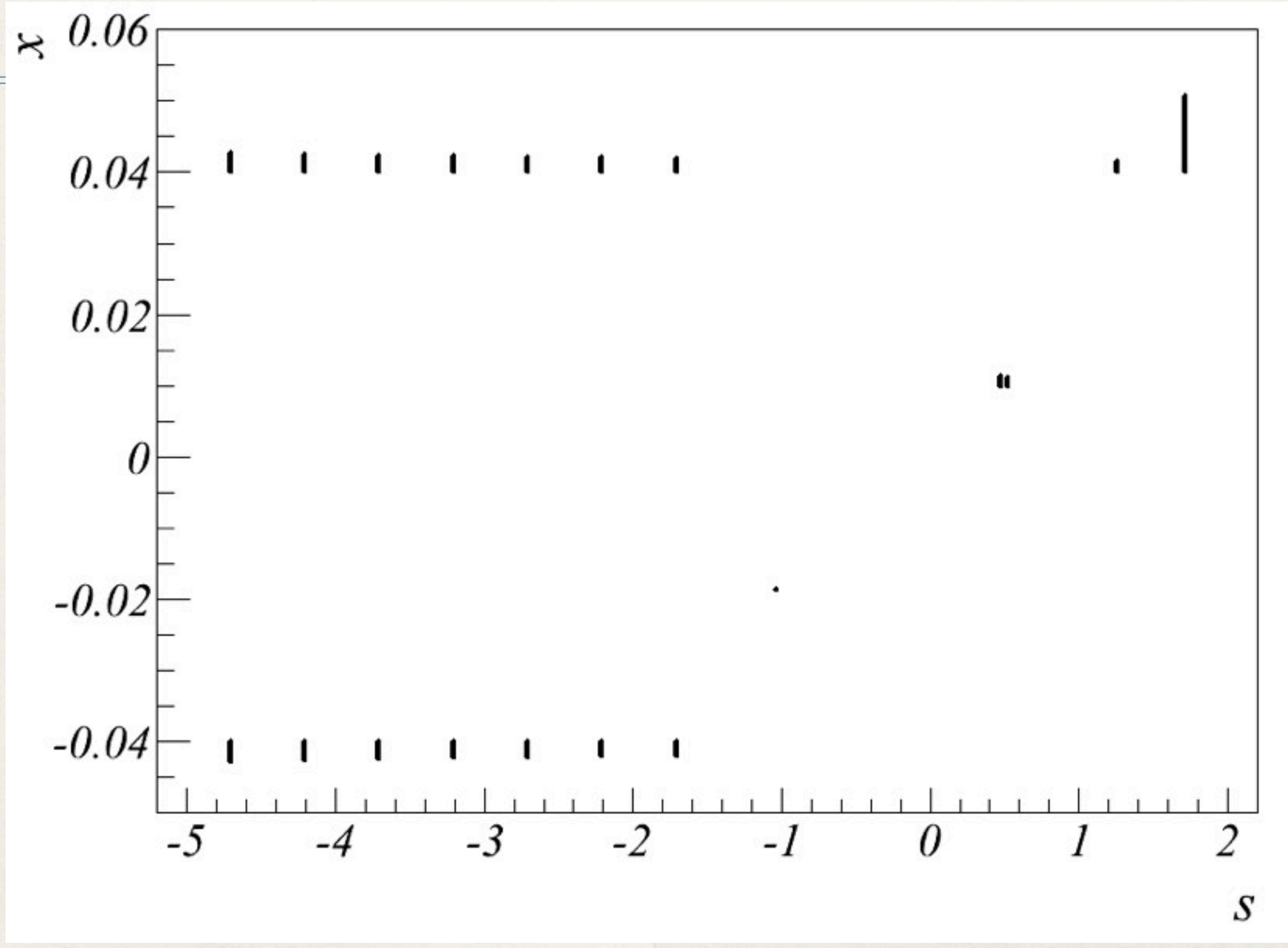
- Manuela developed a program to
  - simulate both the Touschek and the beam gas scattering along the line
  - transport the scattered particles along the lattice
  - detect the collisions of these particles with the vacuum chamber walls
- Typical output

x (m)	$\frac{\mathrm{d}x}{\mathrm{d}s}$ (rad)	y (m)	$\frac{\mathrm{d}y}{\mathrm{d}s}$ (rad)	s (m)	$\frac{\Delta E}{E}$	f (KHz)	#turn
0.445558E-01	-0.550303E-02	-0.126830E-05	0.376408E-06	1.71000	-0.239831E-01	0.818628	1
0.456014E-01	-0.570537E-02	-0.280276E-04	0.113856E-04	1.71000	-0.252154E-01	0.755761	1
0.474620E-01	-0.592261E-02	-0.210435E-04	0.873927E-05	1.71000	-0.249482E-01	0.778852	1
0.432248E-01	-0.531700E-02	-0.179759E-04	0.663319E-05	1.71000	-0.236050E-01	0.997186	1

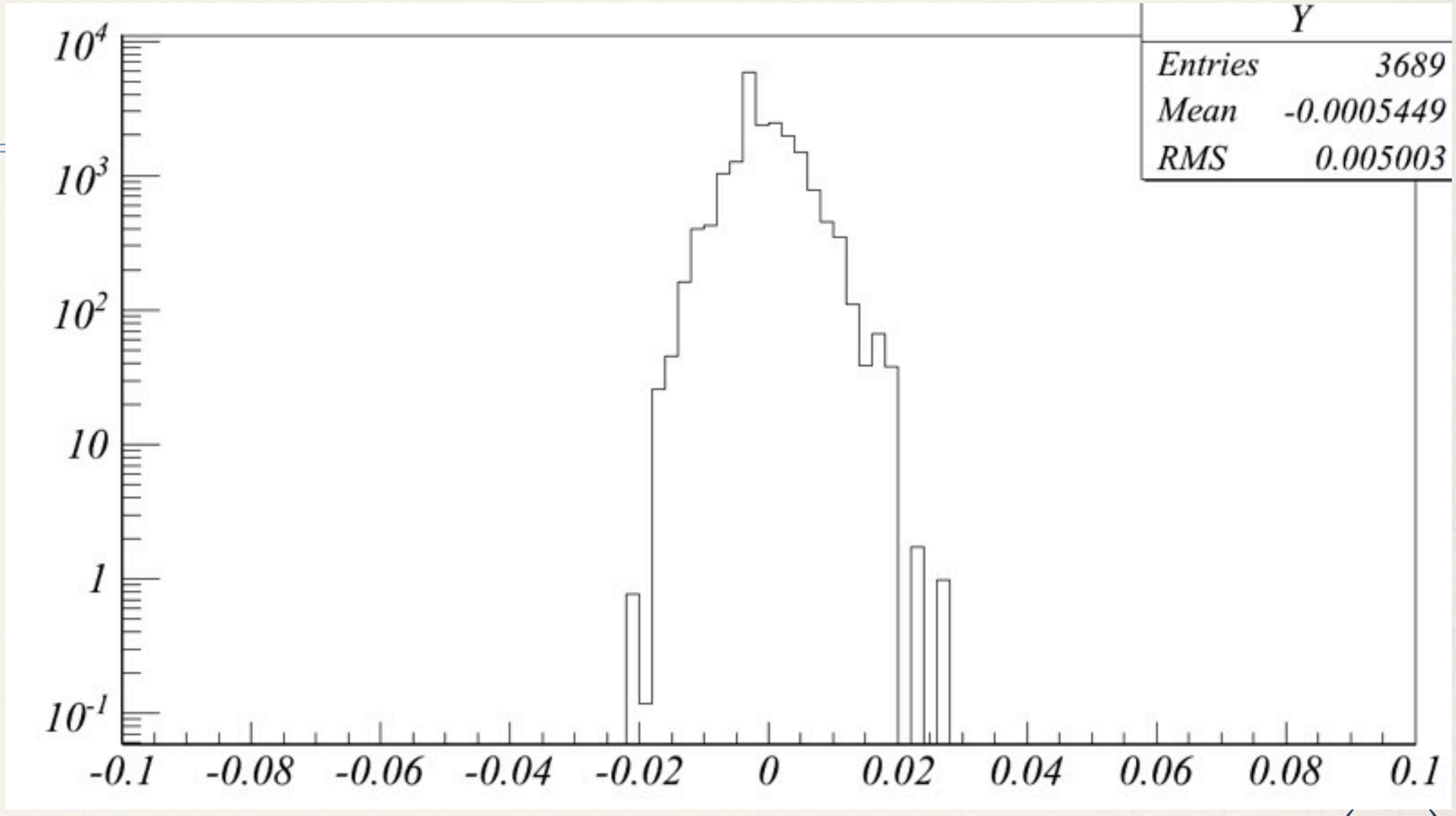
Losses near the IP (LER)



Losses near the IP

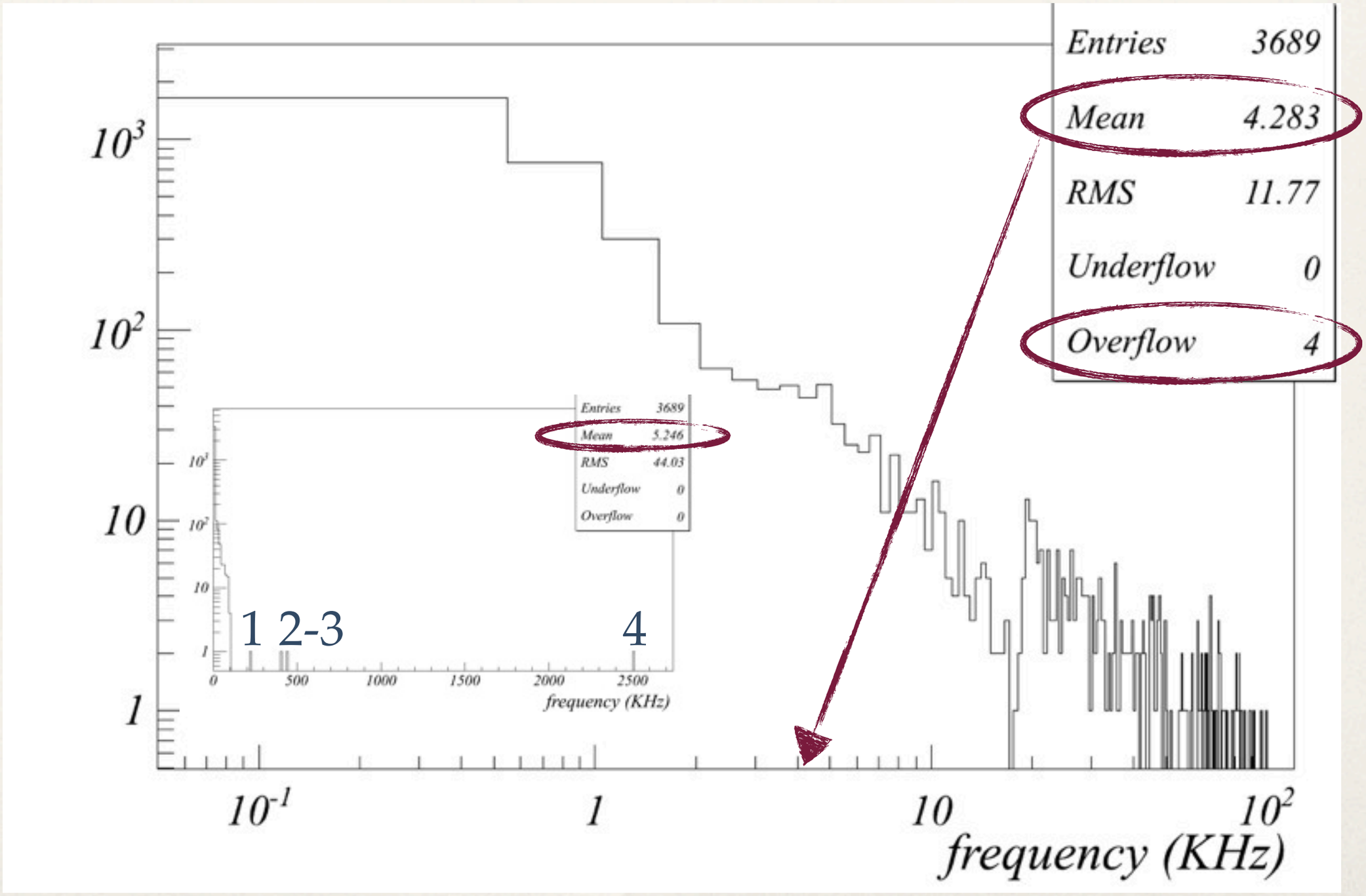


Losses are mainly on the hor. plane

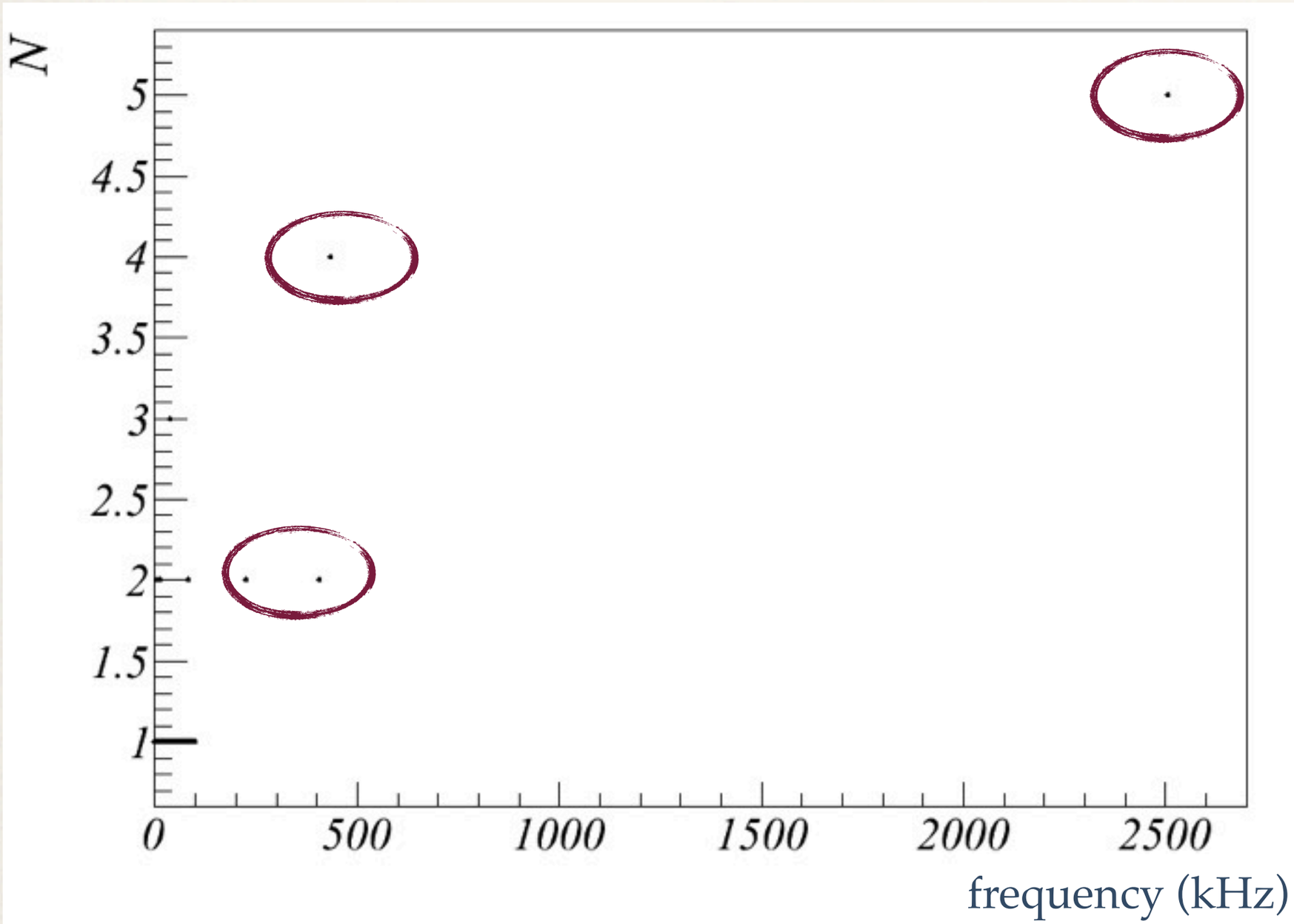


- The macro particle hits the beam pipe with a vertical RMS of 50 microns (y' RMS 4.5 10^{-5} Rad)
- Vertical degrees of freedom are negligible for the bkg Geant simulation

Loss Frequency distribution:
4 macroparticles represent 25% of the sample



Frequencies vs #turn after loss: the four outliers are lost after > 1 turn



Conclusions

- A higher #turns tracking in Manuela code is highly desirable
- A larger macro particle statistic is needed to reduce statistical uncertainties
- I need still to understand how to model the z/x/x' correlations meaningfully
- … work in progress