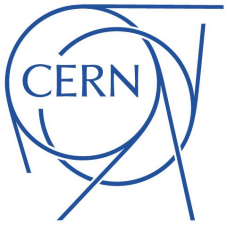


SixTrack & Crab Cavities: Simulation results

Outline

- Reminder: previous status
- Single pass simulations with debris
  - Considerations on debris input
  - Loss maps
- Halo simulations starting at IP2
- Conclusion & outreach

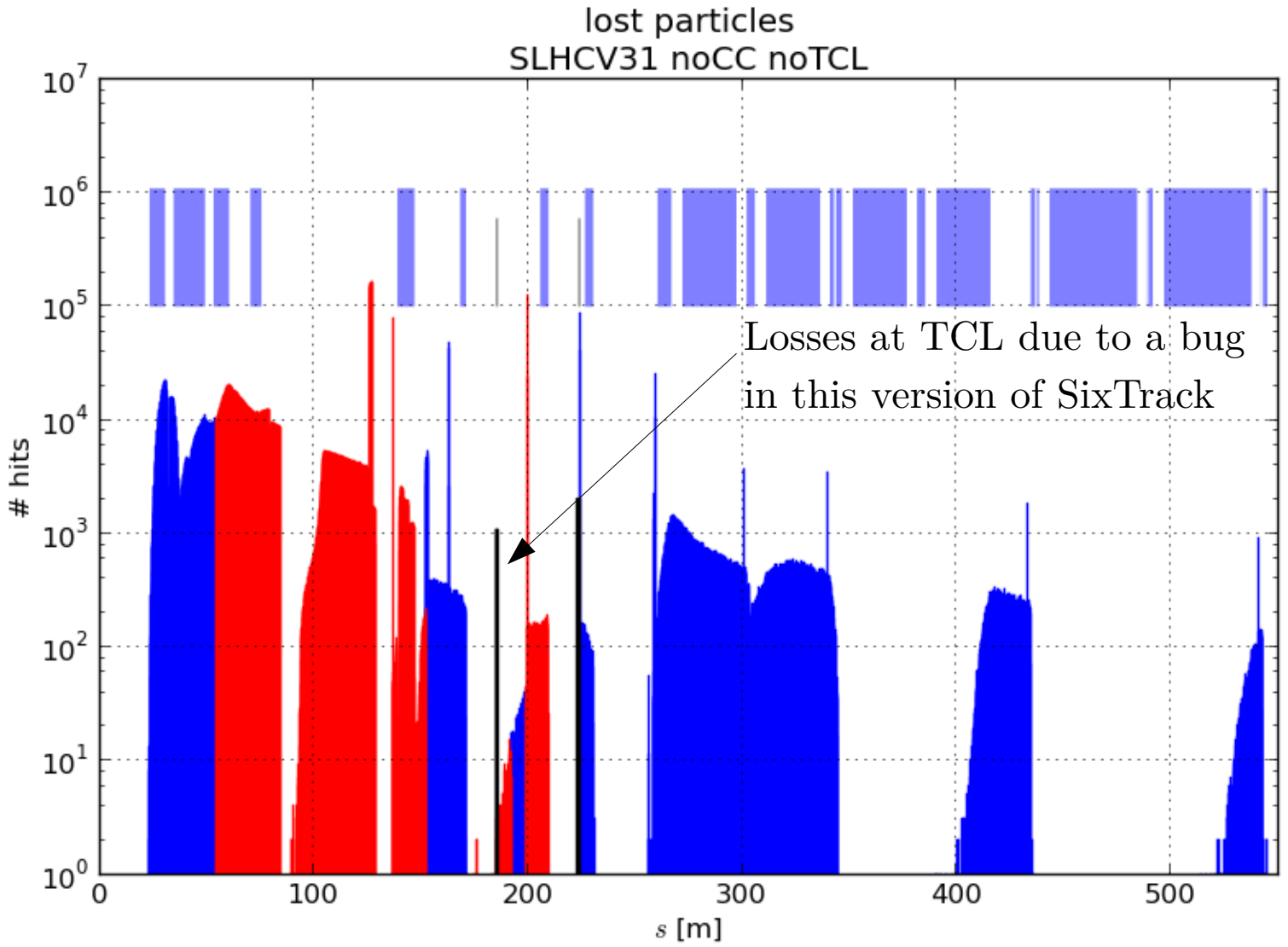
Previous status: validations

- For a given bunch, same trajectories without CC and with CC off
- Effect of CC on a bunch verified
- At IP1, externally-generated input matches tracked distributions
  - /!\ $<y'> = 0$ in dist0.dat, $<y'>$ = crossing angle in checkturns.dat!
- Bunch size conserved over 1000 turns
- Halo distribution conserved over 1000 turns
- Debris + CC inputs generated
- New SixTrack version for debris + CC

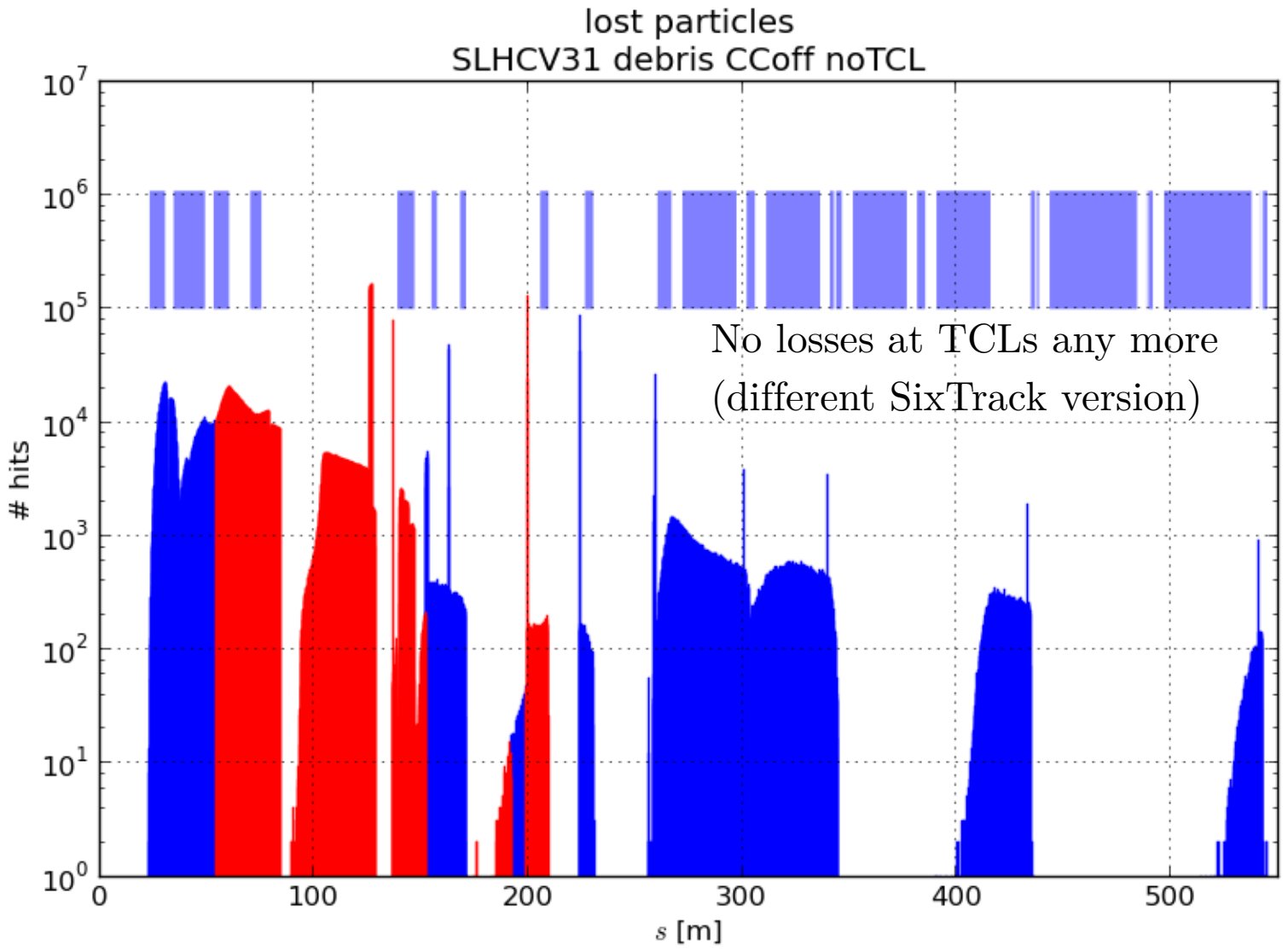
Single pass simulations with debris and CC

- Checks:
  - <y'> = 0 (dist0.dat # checkturns.dat)
  - σ_l # 0 (effect of CC depends on l, there must be an l distribution)
- Loss maps without CC must be the same as with CC off
  - /!\ Bug in SixTrack_checkturns: the last packet (pID 10001→10064) is not written in checkturns.dat but is in FLUKA_impacts, so these particles are considered lost on collimators.
- /!\ No reference for loss map with CC on
- Simulations starting from IP1
- Using SLHC V3.1b (only sequence with CC for now)

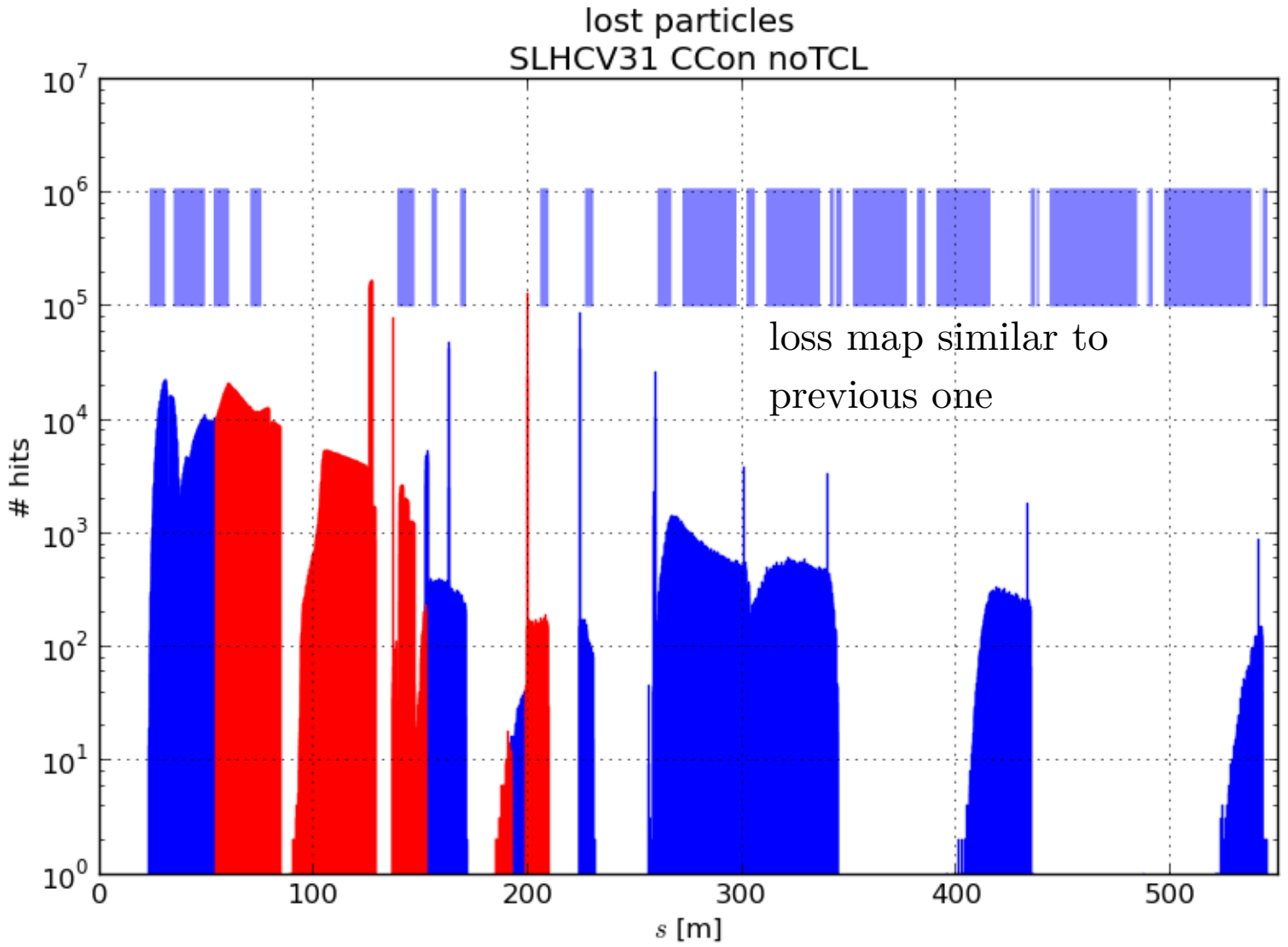
No CC, no TCL


lost particles
SLHCV31 noCC noTCL
hits
10^0
10^1
10^2
10^3
10^4
10^5
10^6
10^7
0
100
200
300
400
500
s [m]
Losses at TCL due to a bug
in this version of SixTrack

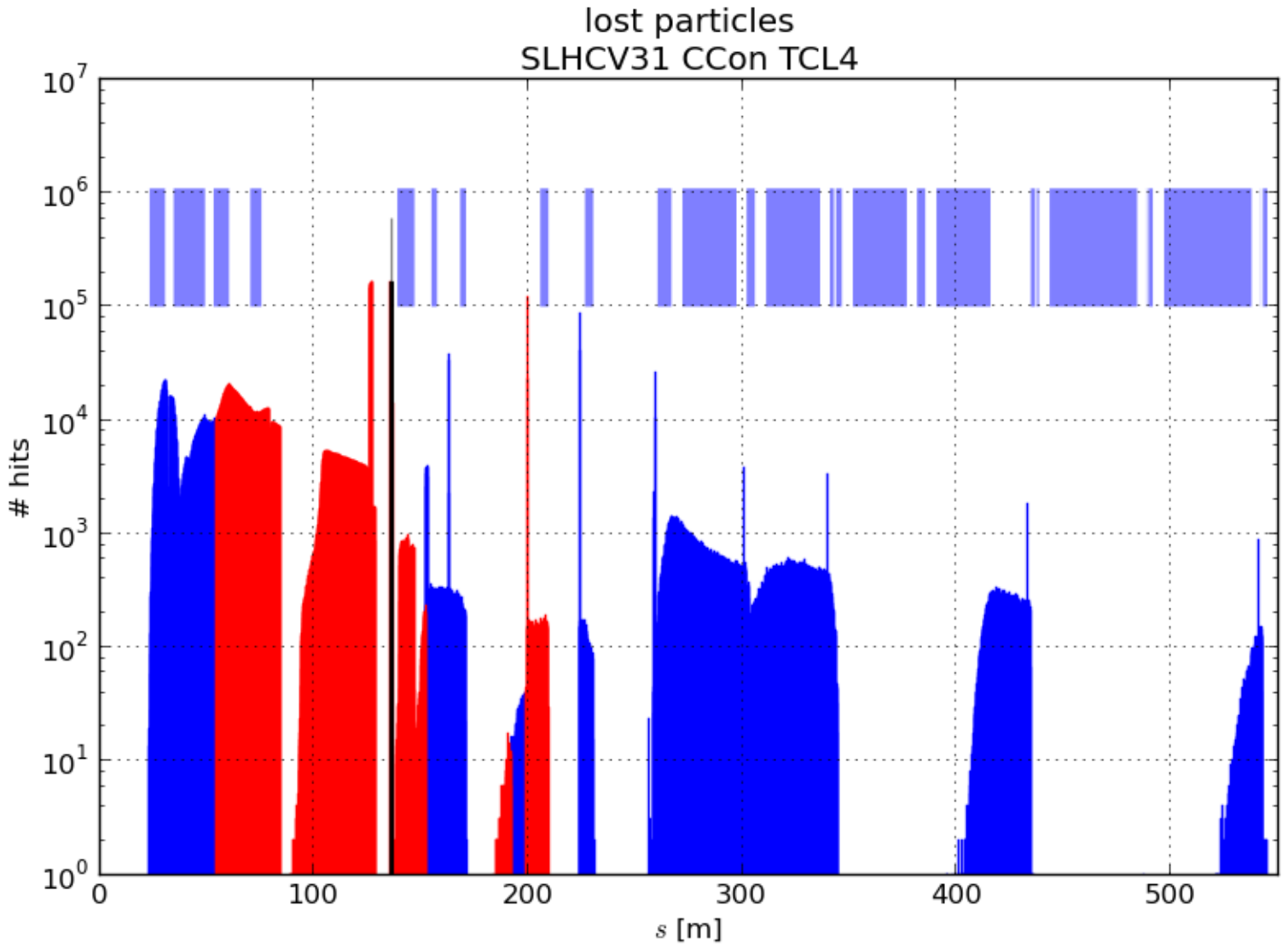
CC off, no TCL


lost particles
SLHCV31 debris CCoff noTCL
No losses at TCLs any more
(different SixTrack version)
hits
s [m]
10^0
10^1
10^2
10^3
10^4
10^5
10^6
10^7
0
100
200
300
400
500

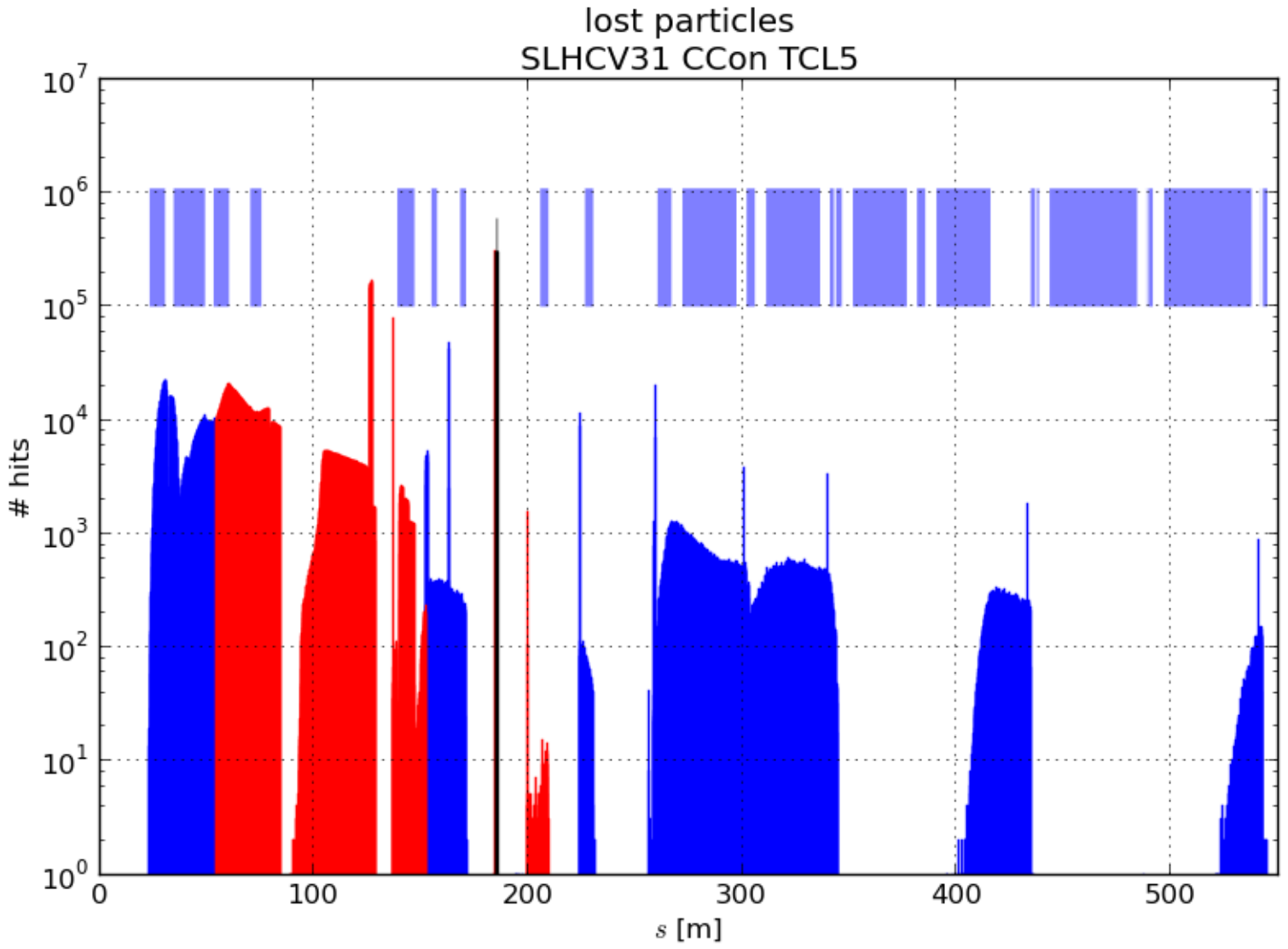
CC on, no TCL
Corresponding debris input



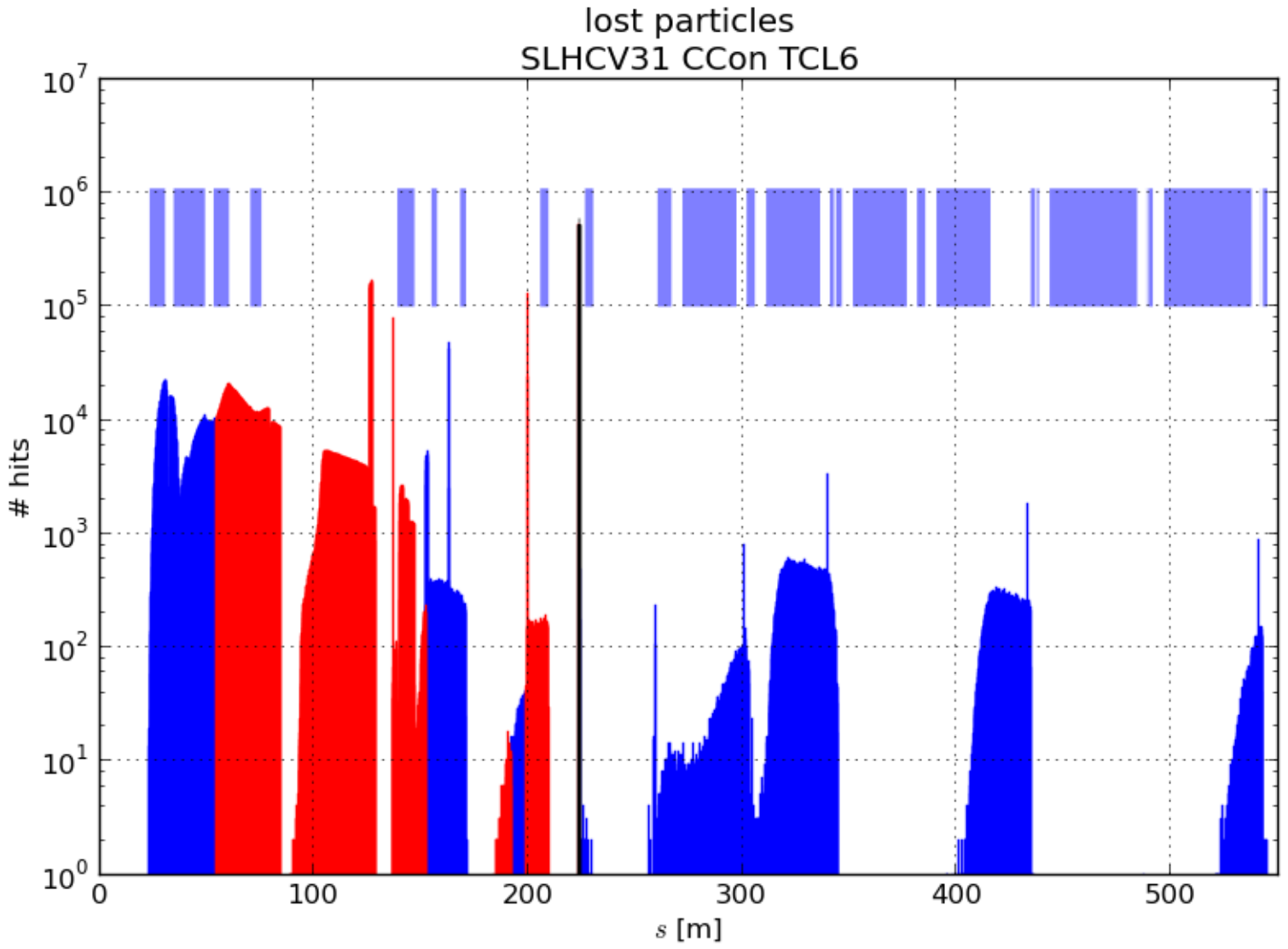
CC on, TCL4


lost particles
SLHCV31 CCon TCL4
hits
10^0
10^1
10^2
10^3
10^4
10^5
10^6
10^7
0
100
200
300
400
500
s [m]

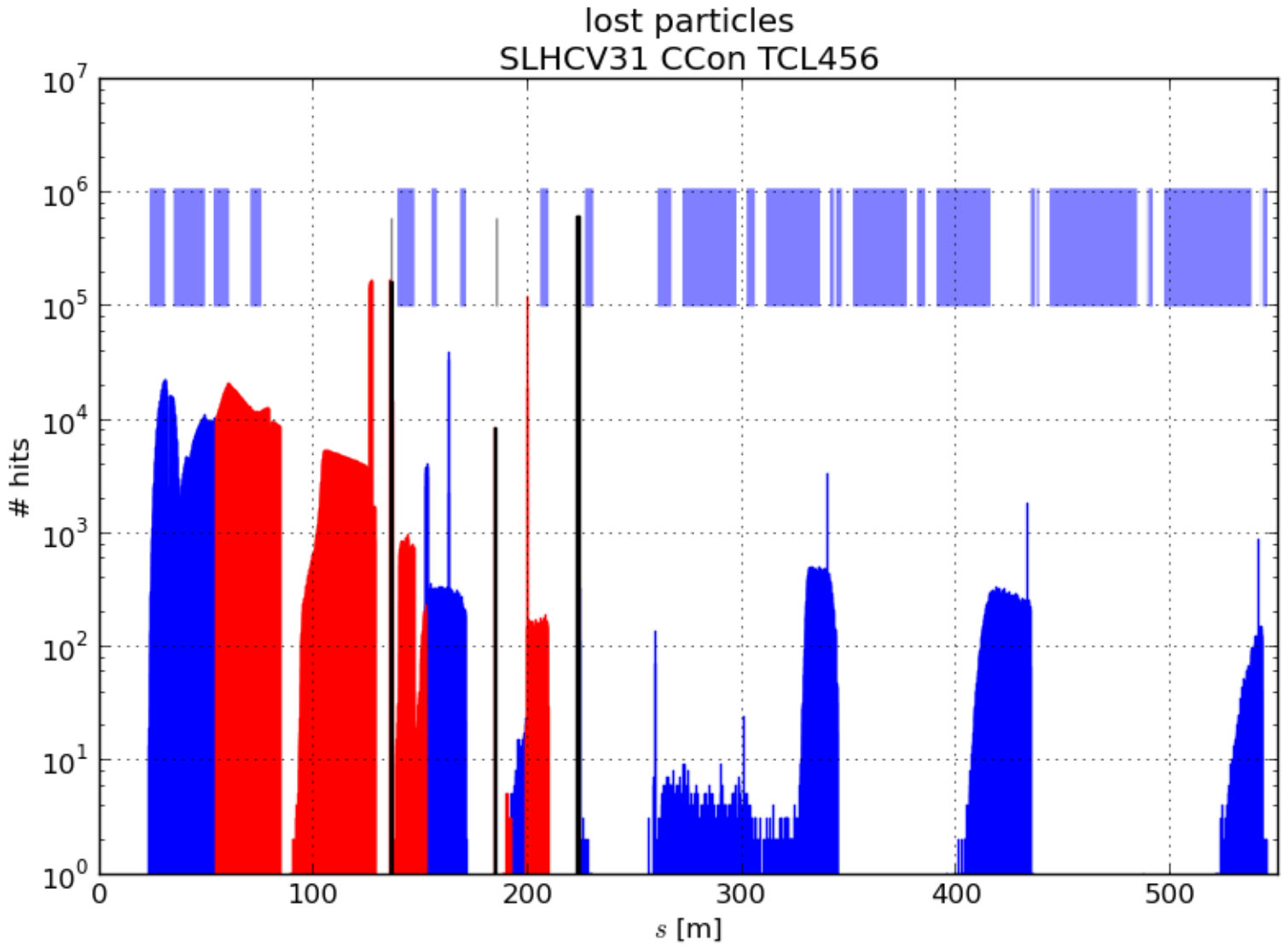
CC on, TCL5


lost particles
SLHCV31 CCon TCL5
hits
10^0
10^1
10^2
10^3
10^4
10^5
10^6
10^7
0
100
200
300
400
500
s [m]

CC on, TCL6


lost particles
SLHCV31 CCon TCL6
hits
10^0
10^1
10^2
10^3
10^4
10^5
10^6
10^7
0
100
200
300
400
500
s [m]

CC on TCL 4, 5 and 6



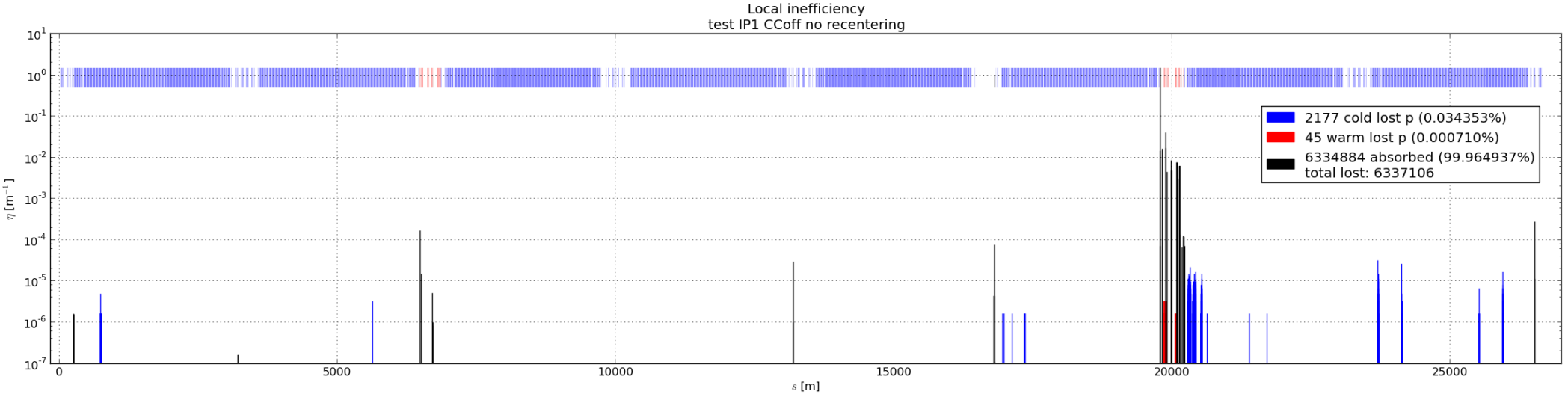
Single pass simulations with debris and CC

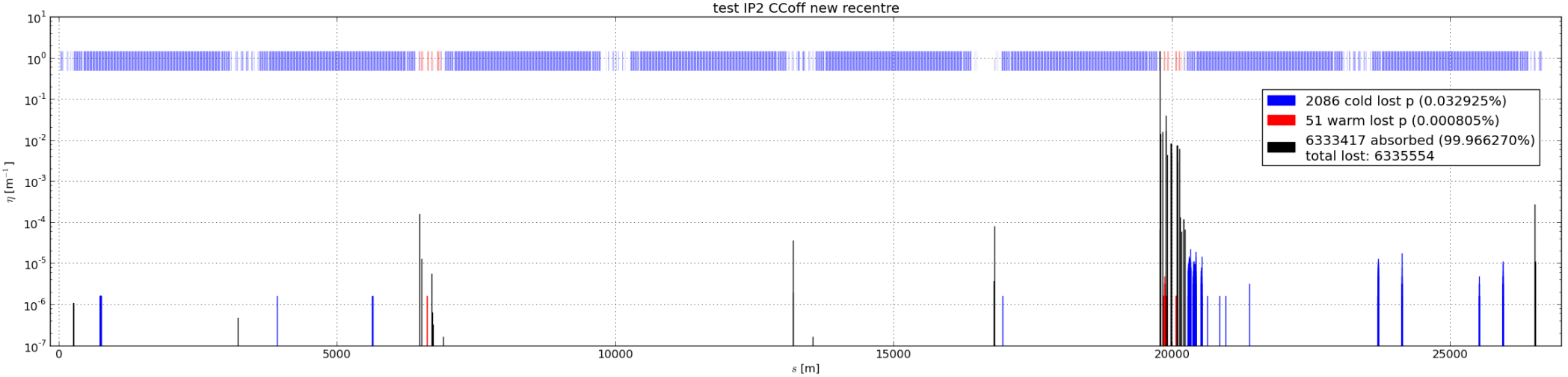
- Addition of CC to the ATS debris simulations: new input
- New result: the CC do not modify the single pass debris losses
- DS protected up to Q9
- /!\ Peaks due to steps in aperture can be a big issue!
  (and may be smoothed out if plotting with different spatial res.)

Halo Simulations

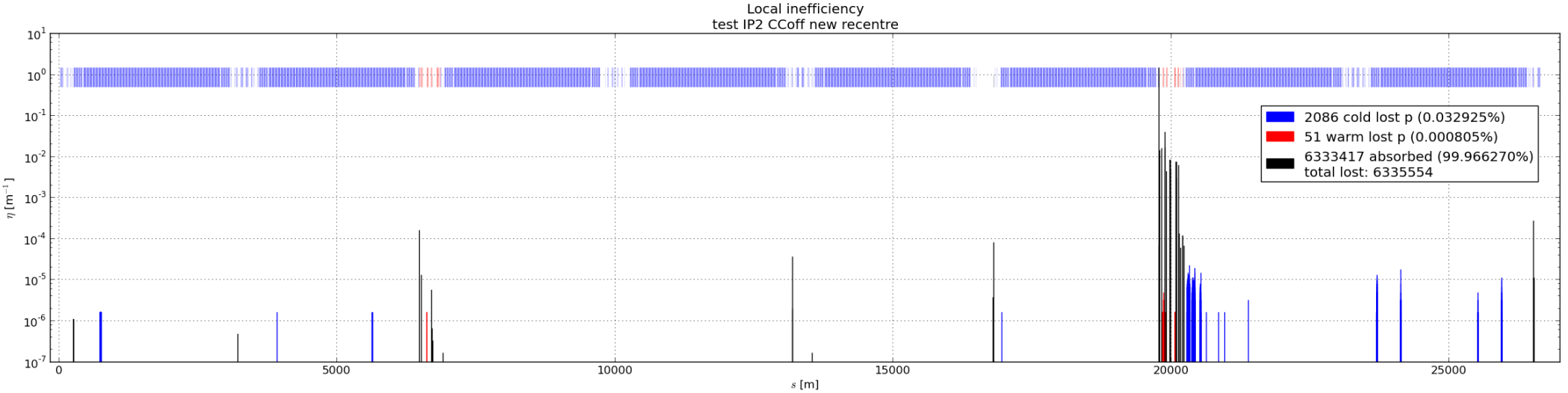
- Sixtrack can't generate a distribution in IP1 including the CC effect
- Multiturn simulations starting in IP2
- Issue with starting point in post-processing
  - Now fixed
  - Assessing which conclusion needs to be changed (none so far)

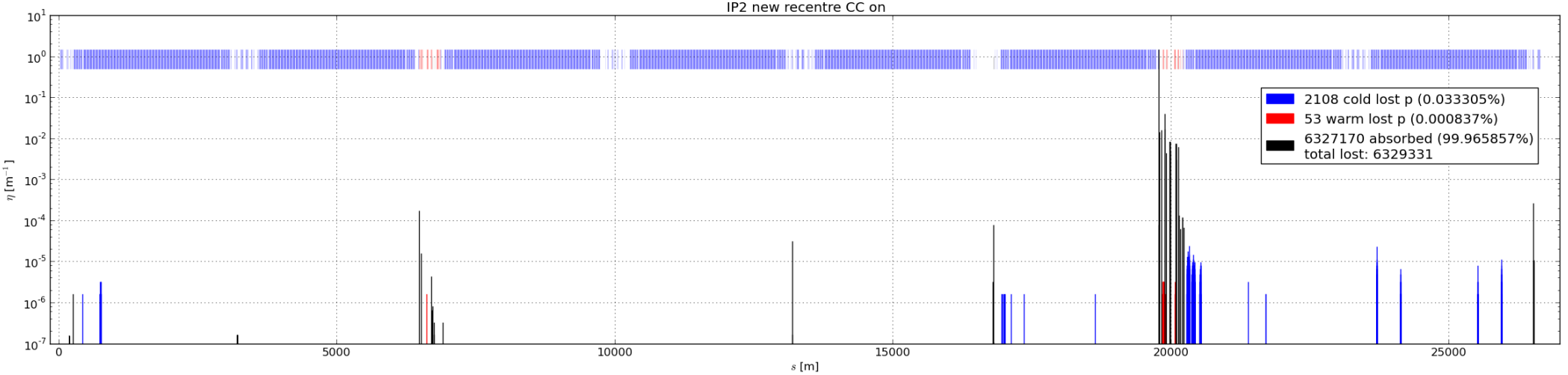
Halo simulations CC off
IP1 / IP2





Halo Simulations IP2
CC off / CC on





Conclusion

- CC work as expected
- Simulation set-up available and checked
- Simulations done for B1: halo, debris
- In normal conditions, CC do not create any extra losses

Legacy
material that only I have

- FLUKA inputs for debris
- Scripts to generate SixTrack debris inputs
- Debris inputs: 4 TeV, 7 TeV, ATS without CC, ATS with CC
- Source + executable for CC (extra input file for CC on/off)
- Source + executable for CC and checkturns (for debris)
- SLHC v3.1b ATS optics with CC – obsolete
- Script to re-write checkturns.dat as tracks2.dat for post-processing