Initial Collimation Scenario and Possible Issues

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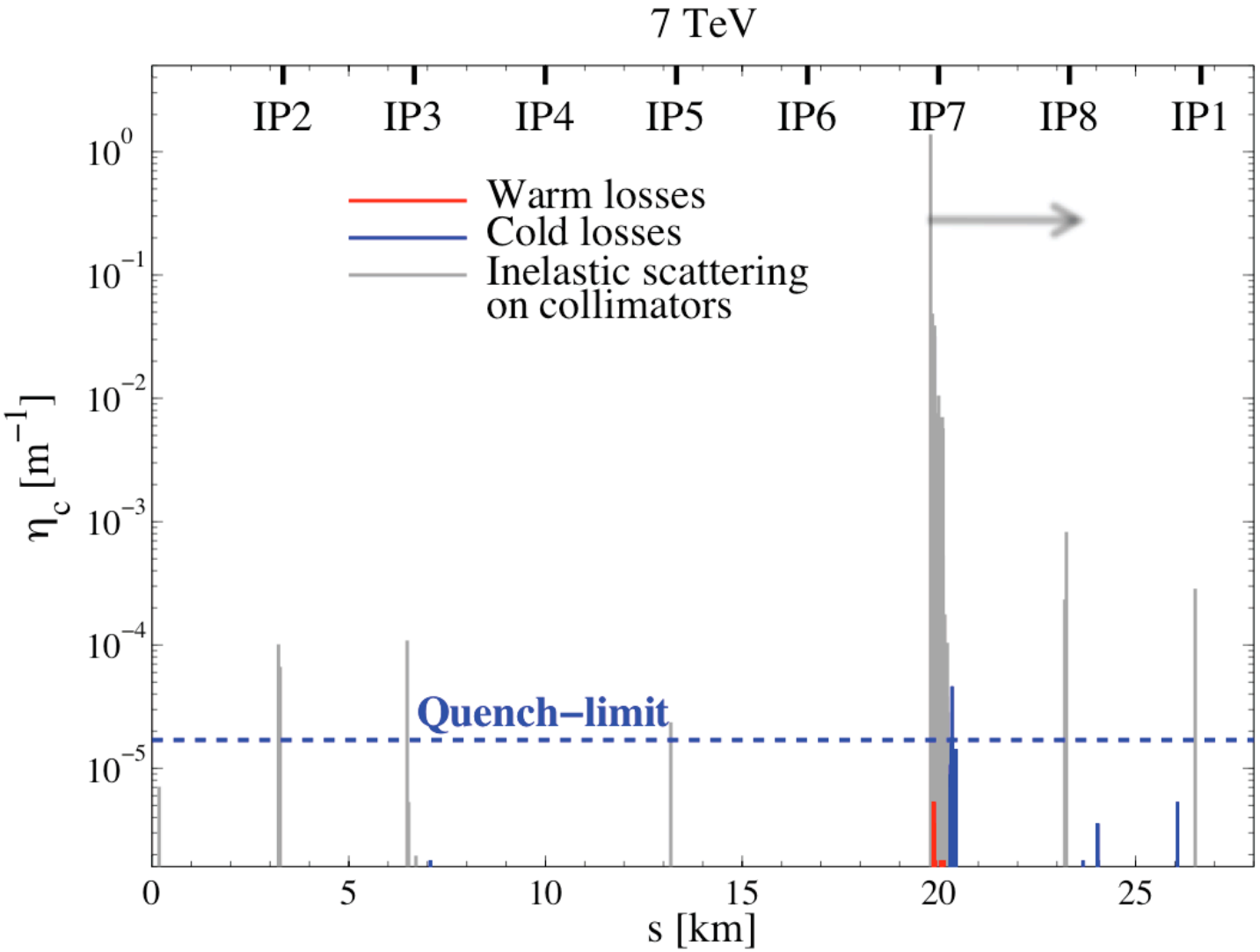
Initial Settings

- The collimation system is commissioned in a clearly defined way, going from more open jaws to more closed jaws.
- The further we close the jaws, the more difficult operation will become.
- The initial scenarios have been studied in detail for accelerator physics:
  - Concept of intermediate settings (Ralph in Chamonix 2007, thesis Chiara, presentation of 2009/10 settings by Adriana).
  - Cleaning efficiency was estimated and intensity reach specified.
  - The cleaning efficiency is limited by dispersion suppressor losses which originate from single-diffractive scattering in primary jaws.
  - Limitations deduced from AP and FLUKA studies, with some assumptions (same impact of imperfections) ➔ my Cassandra talk at LMC.
  - Intensity limit from cleaning efficiency was included for 2009/10 run plan: luminosity versus time.
  - Well aware of limited power to predict: loss rates, quench limit, SD process, …

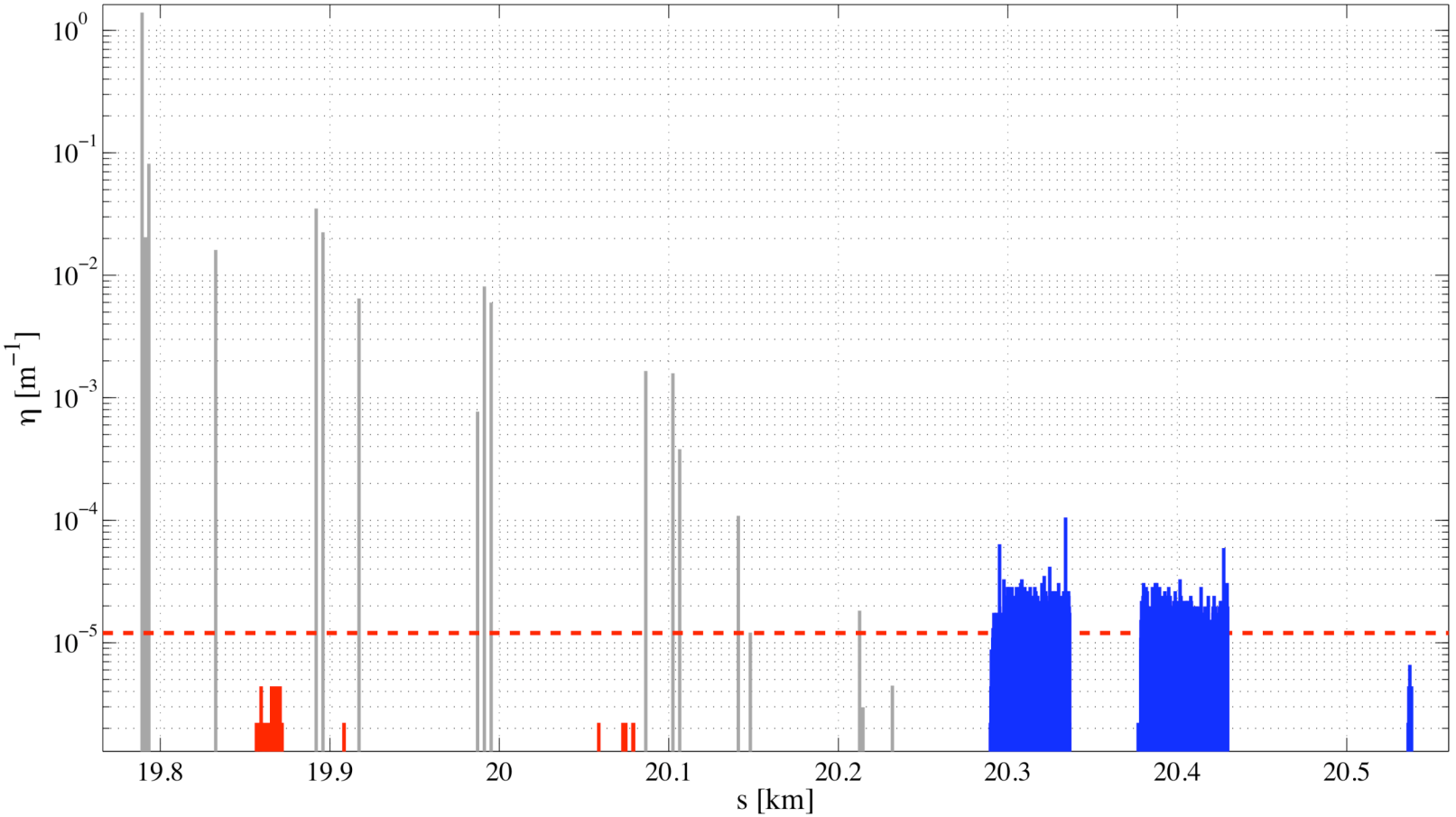
2009/2010 LHC Goals

- The 2009/2010 goals have been formulated with the collimation and beam-beam limits in mind. Presented widely (see talks M. Lamont, M. Ferro-Luzzi, …).
- Still, very challenging requirements for 3.5 - 5 TeV:
  - Up to 4e13 protons per beam: up to 13% of nominal
  - Up to 34 MJ per beam: up to 9.4% of nominal
- If compared to the world record in SC proton colliders, this is very challenging:
  - We must beat the world record in stored energy in the first year of LHC operation by a factor ~15.
  - Our SC magnets are more sensitive to beam loss than Tevatron and HERA.
- Always good to worry: Is there any other effect that will limit us initially ➔ energy deposition?
- It is evident with more open jaws: More losses downstream in fixed aperture!

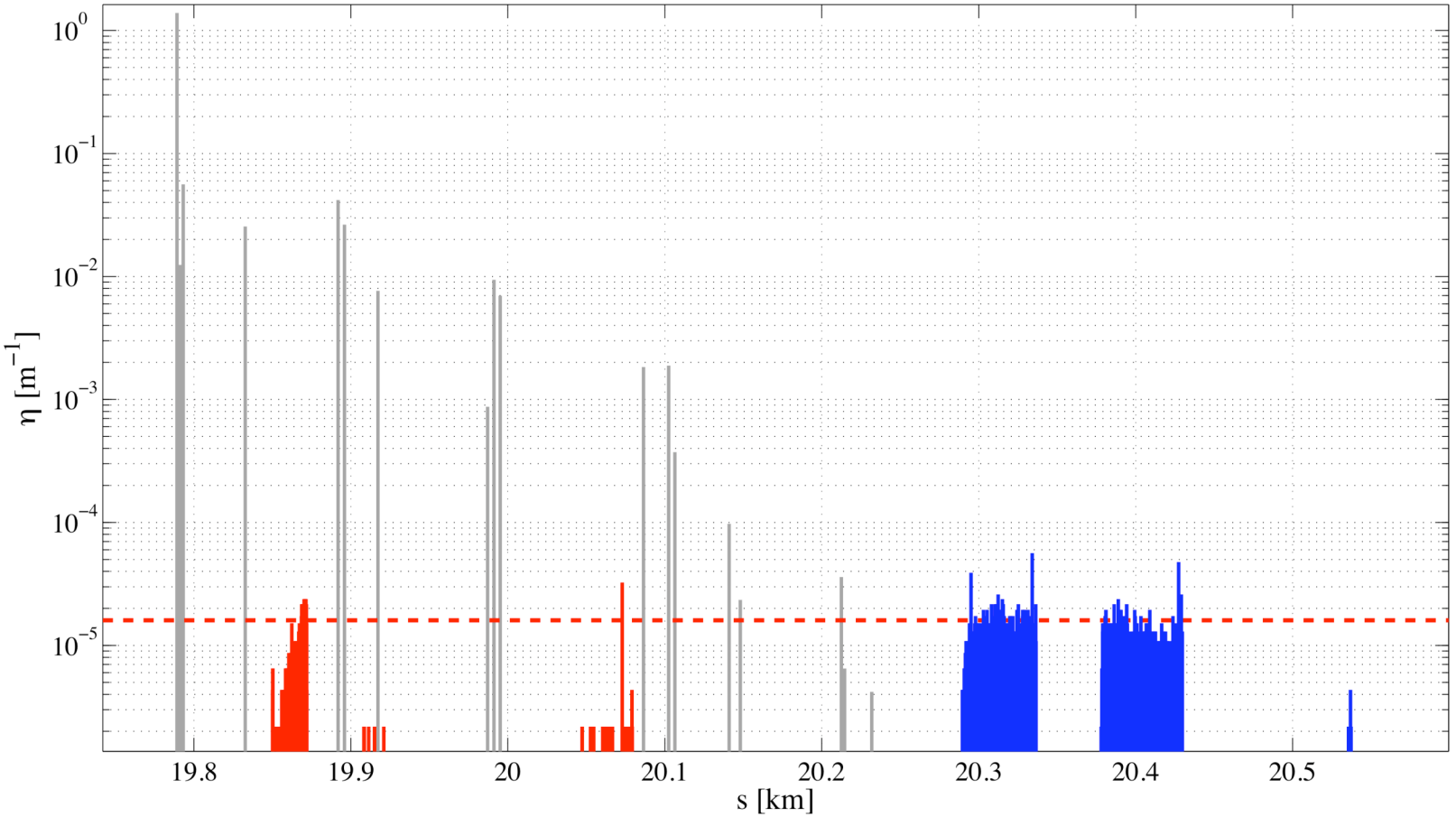
7 TeV Reference Case (Y)



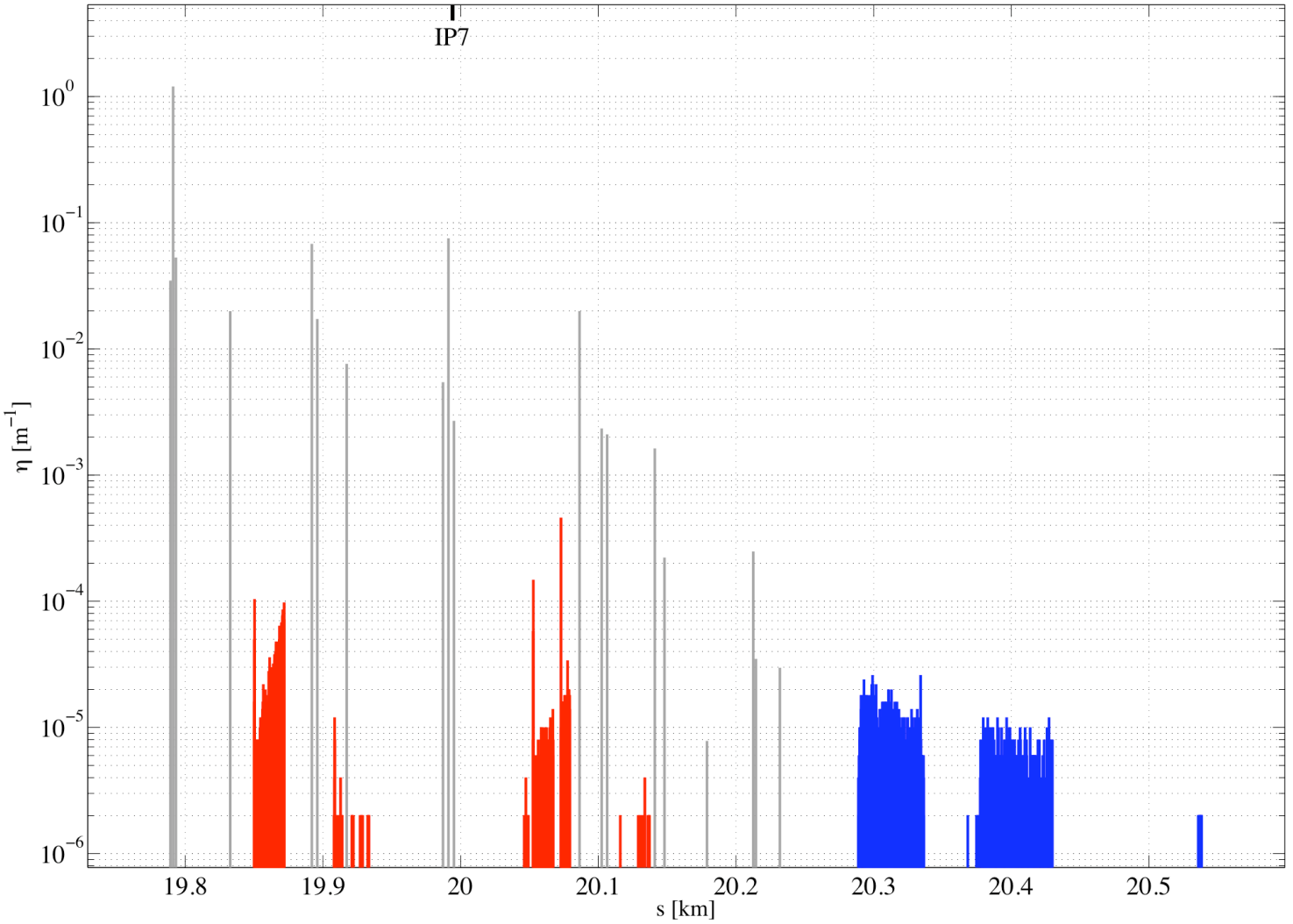
7 TeV with Intermediate Settings (Y)



5 TeV Case (Y)



3.5 TeV (X)


IP7
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
η [m^{-1}]
19.8
19.9
20
20.1
20.2
20.3
20.4
20.5
s [km]

Outlook

- We see very significant losses in the warm aperture, even for the perfect case: up to 5e-4 of primary losses.
- If we add a factor 10 for imperfections: up to 5e-3 of primary losses.
- Up to 5 kW into warm elements for 2009/10 parameters?
- Possible issues of over-heating and radiation damage!
- This does not include the energy carried forward from showers, originating in the collimators. Will also go further with less closed collimators?
- We must check with FLUKA that the 2009/10 operational parameters are safe for energy deposition and radiation damage!
- This study concerns the long straight section: no impact from SD!
- Margin for the dispersion-suppressors was taken into account.
- Feedback for other issues, if any, is important.