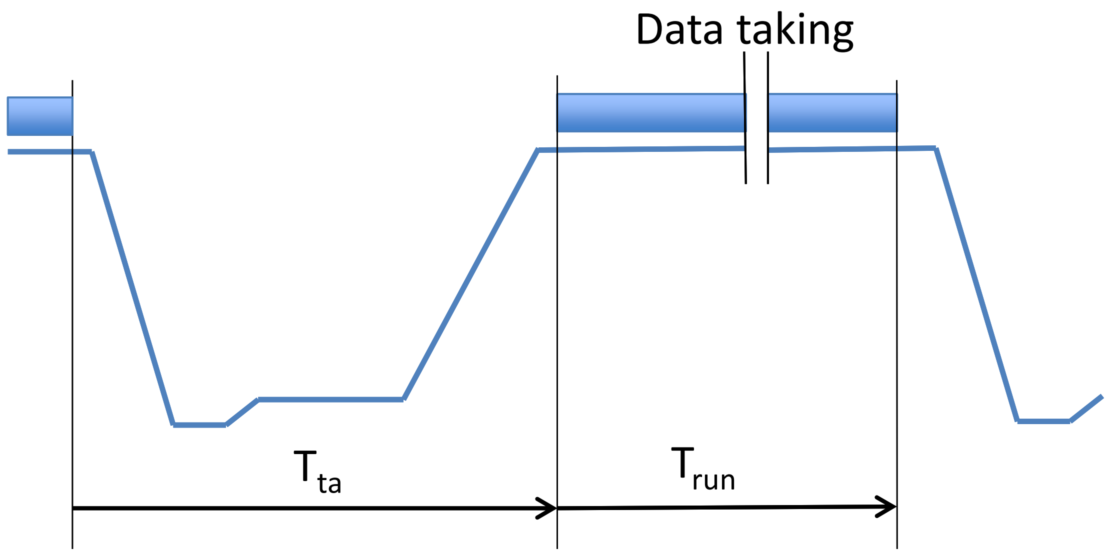
Impact on luminosity of Turn-around time, Run time etc.

R. Garoby

Joint HL-LHC/LIU brainstorming
24/06/2011

Definitions (reminder…)

$$\tau_{eff} = \frac{N_0}{L_0 \sigma n_{IP}}$$



Case of no Levelling

Luminosity evolution $$L(t) = \frac{\hat{L}}{\left(1 + t/\tau_{eff}\right)^2}$$

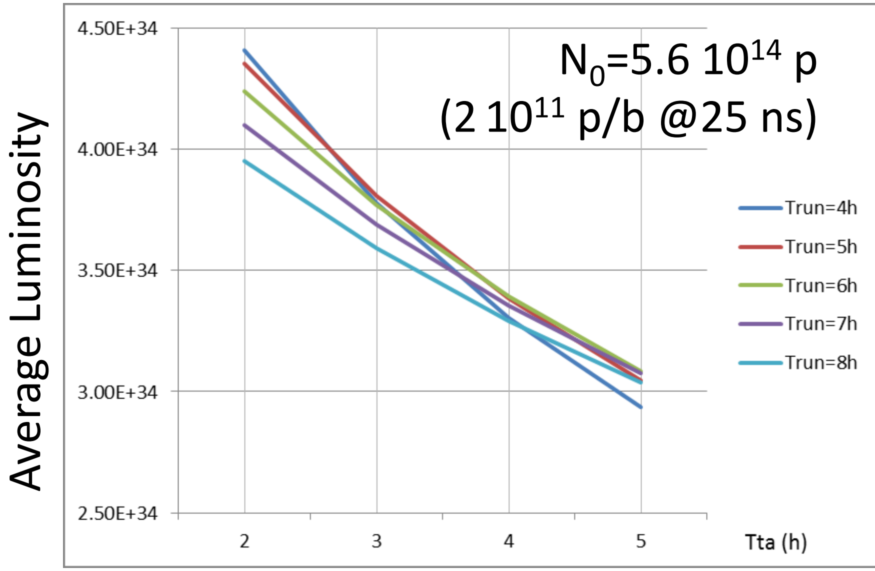
Average luminosity $$L_{ave} = \hat{L} \frac{\tau_{eff}}{\left(\tau_{eff}^{1/2} + T_{ta}^{1/2}\right)^2}$$

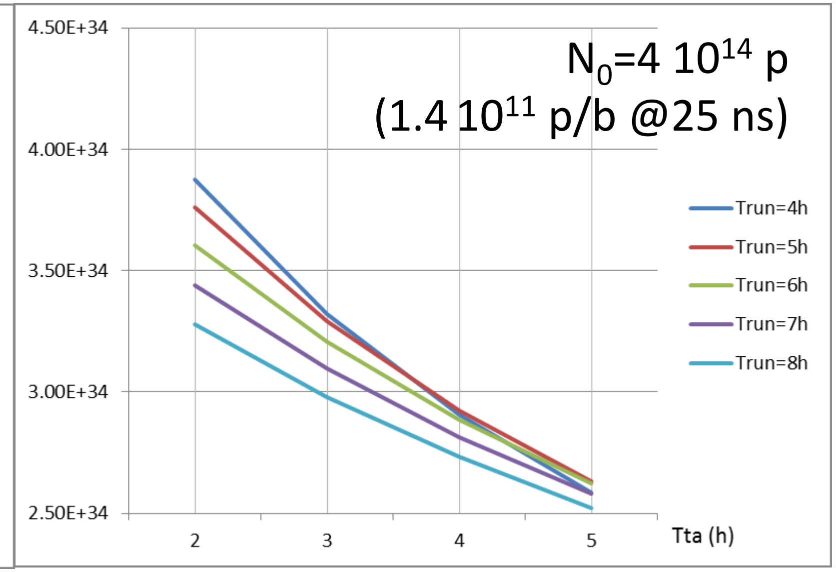
Optimum T_{run} $$T_{run} = \sqrt{\tau_{eff} T_{ta}}$$

Cf. F. Zimmermann – Chamonix 2011

Average Luminosity § Luminosity at end of coast

Initial Luminosity (L_0): 10^{35} $cm^{-2}s^{-1}$

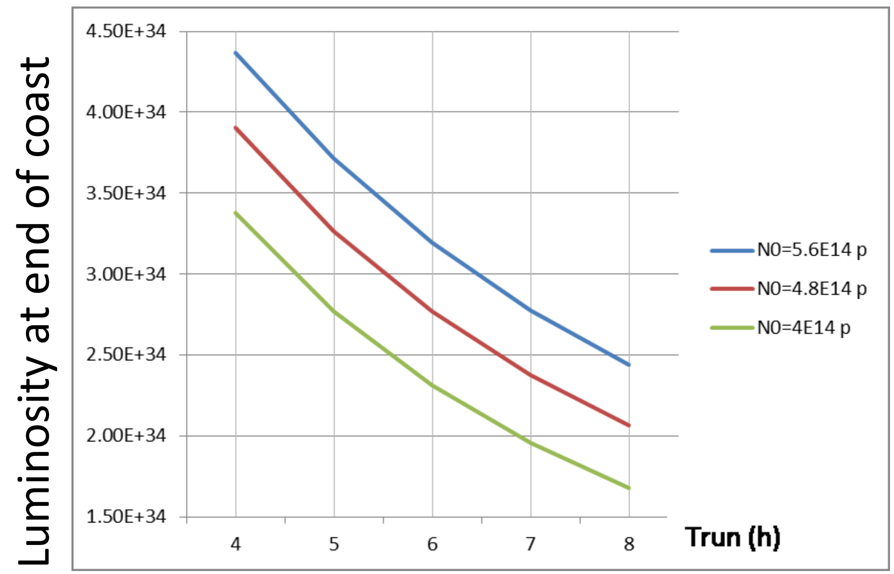




<u>Observations:</u>

- T_{ta} is the main factor for a high average luminosity
- Case 1: if T_{ta} has to be in the range 4-5 h, T_{run} has small impact
  - ⇒ a low T_{run} can be used
  - ⇒ small dynamic range in L: need for levelling?

- Case 2: if T_{ta} can be made small (2-3 h), T_{run} shall preferably be small
  - ⇒ small dynamic range in L: need for levelling?



Conclusions

- Working on the reduction of T_{ta} will be highly rewarding (2-3 h ?)
- T_{run} does not need to be very long (4-5 h is fine)
- The dynamic range in luminosity will not exceed a factor of 3: does it justify levelling?
- A small T_{run} (4 h) is compatible with a moderate intensity (4 10^{14} p)…