The European Strategy Committee has decided to construct CLIC at 380 GeV as the next project. However the construction can only begin in several years, since international negotiations are ongoing. As the DG of CERN you have to define an R&D programme for these years. The goal is to reduce the risk, the cost and the power consumption of CLIC and to maximise the luminosity. Which R&D would you focus on? Please justify your choices and highlight the impact on the machine parameters that the proposed R&D could yield if successful.

The requested considerations are twofold:

- Take the CLIC parameters as final parameters and suggest R&D in the technology domain in order to reduce the technology risk or to lower the cost.
- Work on the overall beam parameter list of CLIC. Try to understand the significance of all major beam parameters and try to optimise the design. The luminosity and energy should be maintained or improved and the technical risk, cost and power consumption reduced. In which part of the collider should one attempt to improve which beam parameters? How would that translate into performance? Is there related other R&D that should be carried out in order to be able to be able to profit from?

Please consider the luminosity formula from the lecture

$$\mathcal{L} \propto H_D \frac{N}{\sigma_x} I \frac{1}{\sigma_y}$$

The different R&D teams have already made some proposals that you can use as a starting point and which you find below. Please consider that some improvements might require changes to other parts of the collider to become effective.

- The damping ring team proposes R&D to

  Increase the bunch charge for otherwise constant beam parameters.

  Reduce the horizotnal emittance.

  Reduce the vertical emittance.

- The beam delivery system team proposes R&D to

  Reduce the vertical beta-function at the intgeraction point.

  Reduce the horizontal beta-function at the intgeraction point.

- The main linac RF team proposes

  Increase the gradient in the accelerating structures for the same pulse length.

  Reduce the transverse wakefields by novel magic cell design.

  Reduce the longitudinal wakefield by novel magic cell design.

  Improve the multi-bunch wakefield damping.

- The alignment and stabilisation team proposes R&D to
  Improve the magnet position stability.
  Improve the pre-alignment of the beam components.
- The beam dynamics team proposes R&D to
  Improve the beam-based alignment procedures.
  Improve the beam-based feedback system design.