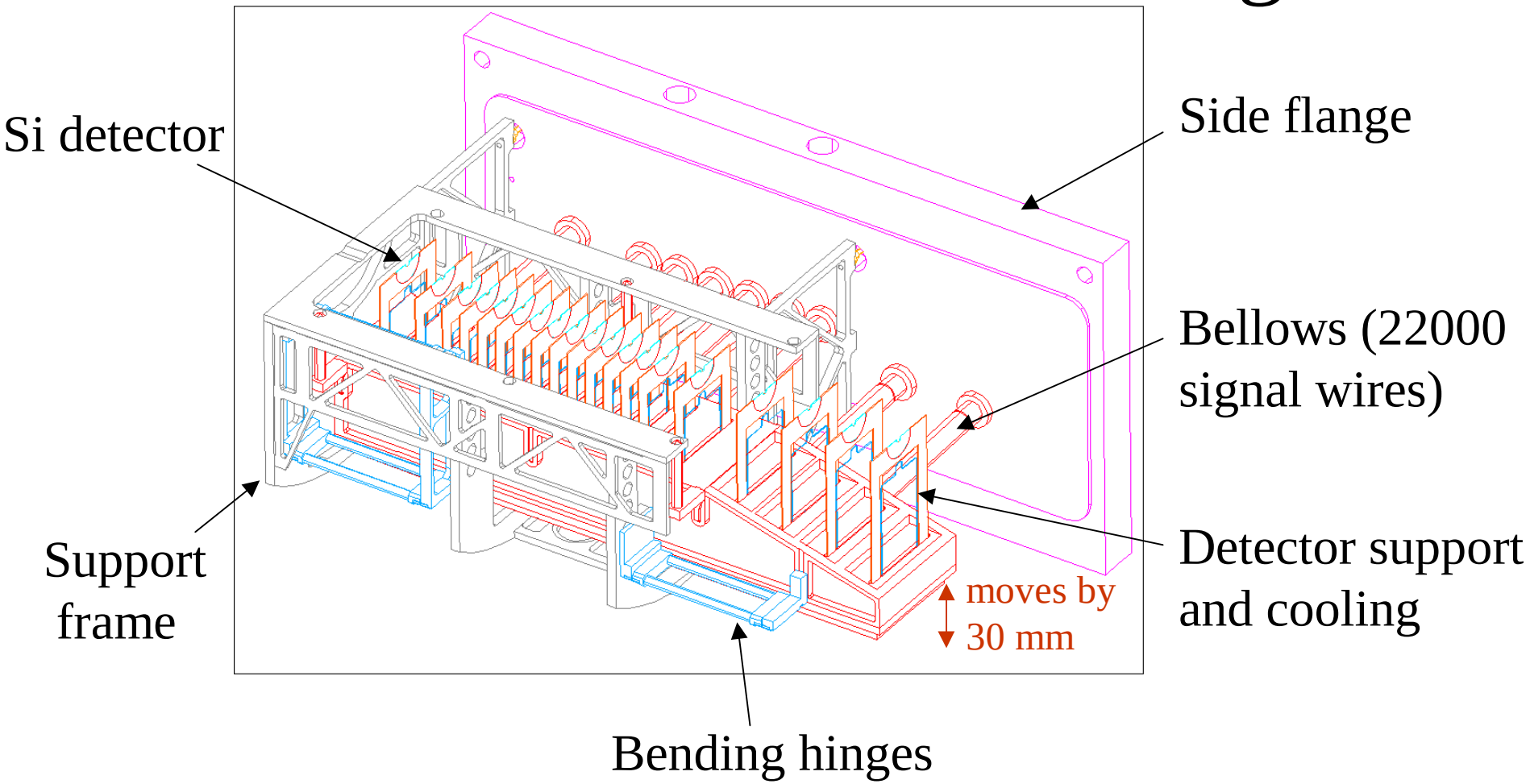
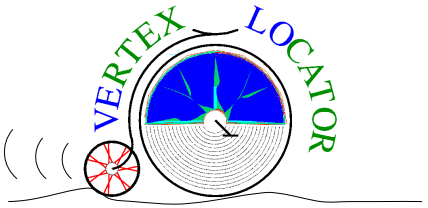
LHCb Vertex Detector System

- Reminder of current VELO design
- Controls:
  - Motion mechanics
  - Vacuum system
  - Cooling system
- What needs to be done ?

Mechanics: current (obsolete) design



VELO in Motion



Function:

- detector halves movable vertically by 0-30 mm with (rough) intermediate steps (formerly, only "open/closed").
- Provide remote controlled system to align the complete VELO in the x-y plane with respect to the beams, within the range ±5 mm.

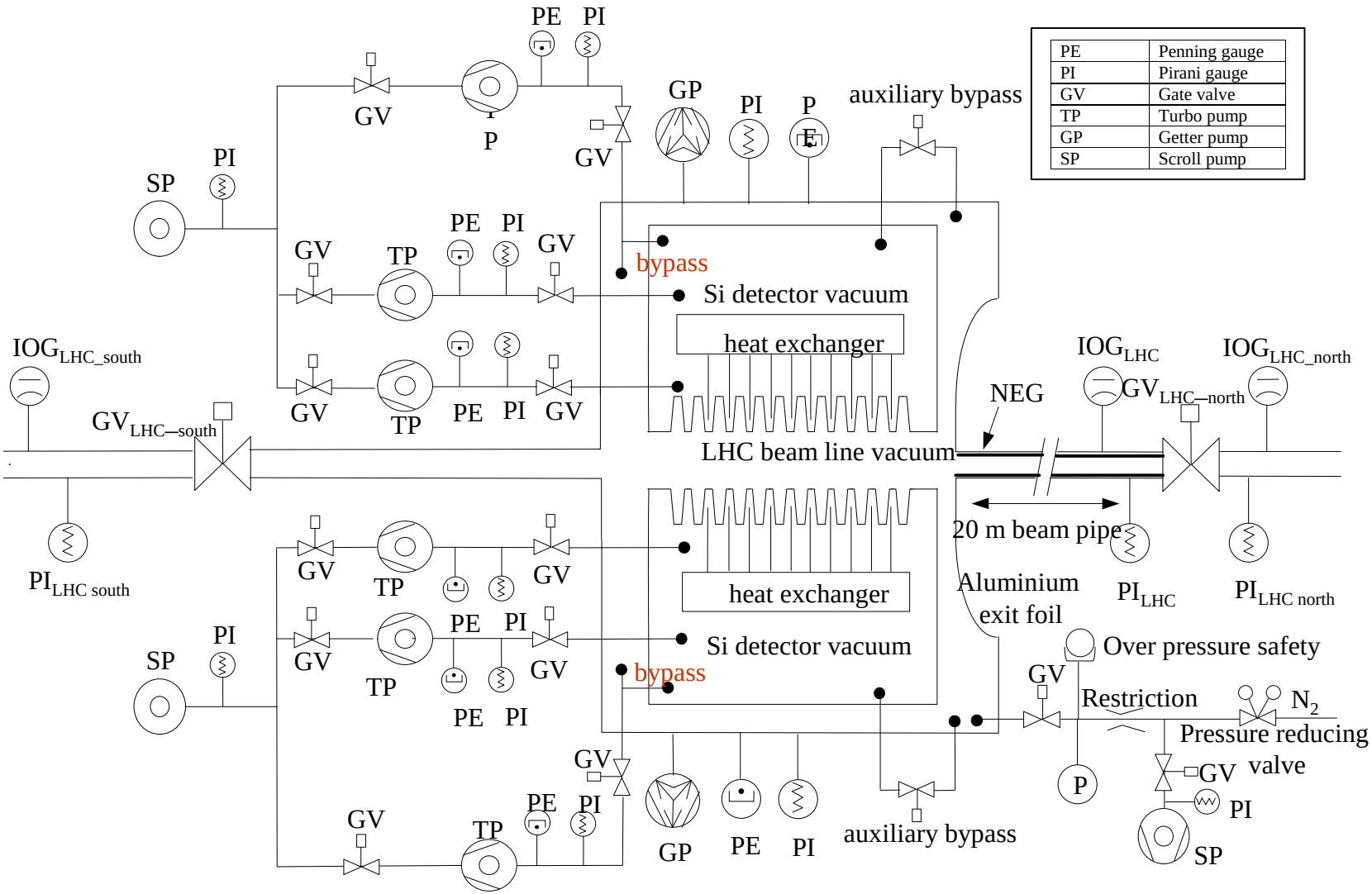
Controls:

- stand alone
- use internal and external info (*e.g.* from VELO tracking, background monitor(s), from LHC BPMs, LHCb alignment survey ?)

Interlock:

- Will involve several (delicate!) levels of safety (hardwired, PLC's, …)
- Use beam alarm, background levels, position monitors, etc.

Differential Vacuum System



VELO Vacuum System

Design:

- Si stations are in a separate vacuum (~10^{-4} mbar)
- Separation from beamline vacuum (~10^{-7} mbar) via thin Al foil

self-opening valves

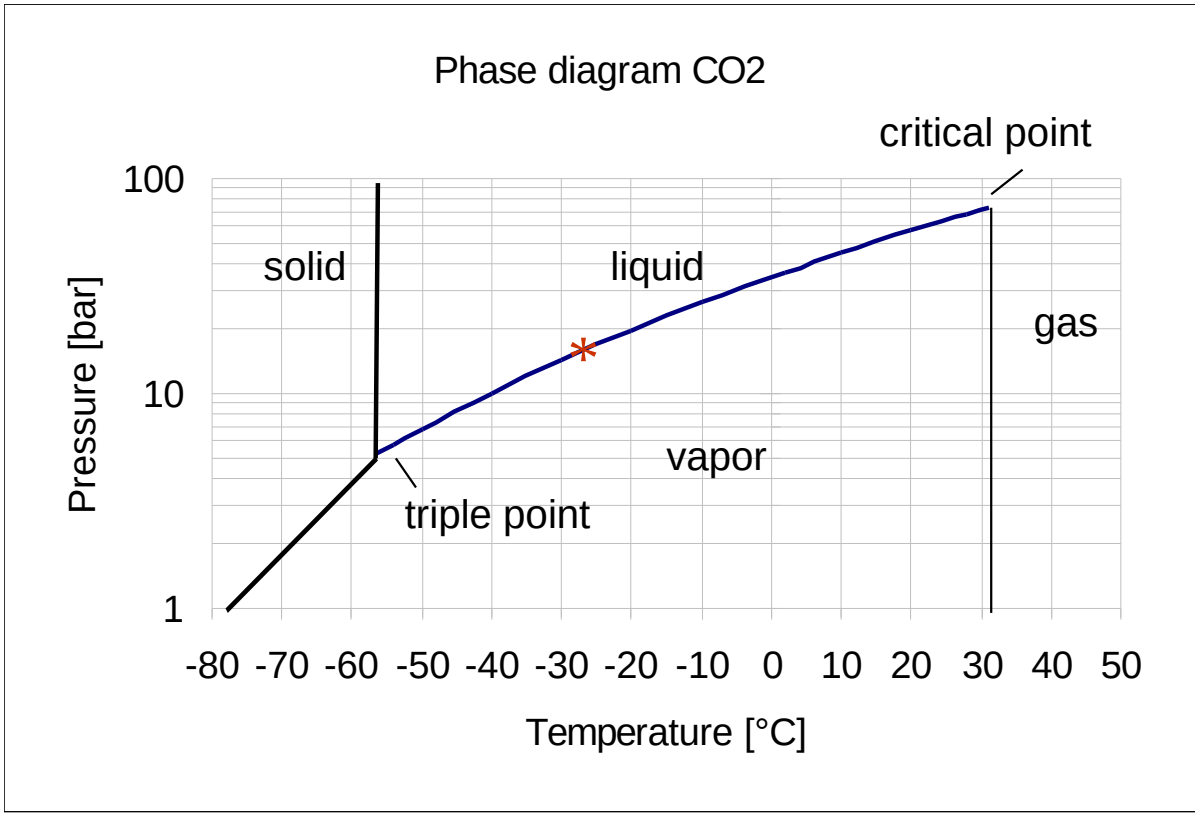
Controls:

- stand alone
- use internal and external info (from LHC vacuum system)

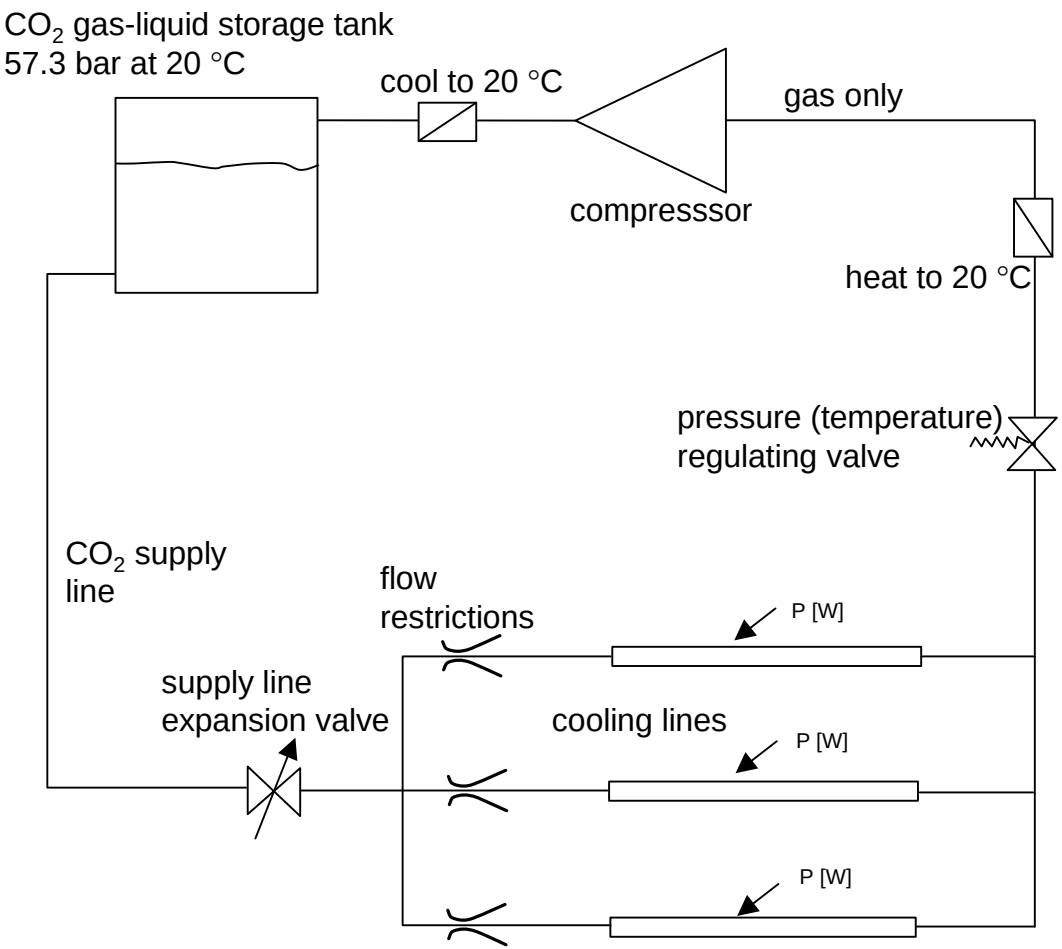
Interlock:

- Will involve several (delicate!) levels of safety (hardwired, PLC's, …)
- exchange status info with LHC vacuum system, hall status, etc.

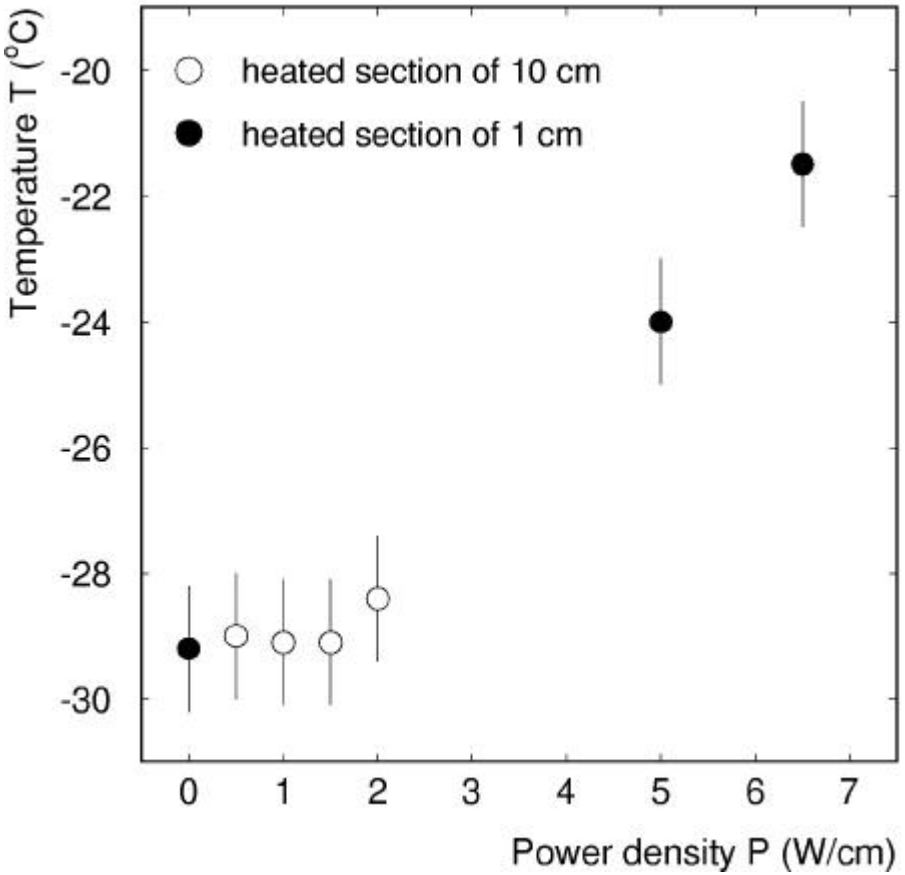
Cooling system with mixed-phase CO_2



Mixed-phase CO_2 Cooling system



See LHCb 99-046/VELO



VELO Cooling System

Design:

- provide a cooled pipe with sufficient cooling power for each Si module
- settable pipe temperature (-25 … 10 °C)
- self-adjusting flow of coolant by physical loop

Controls:

- stand alone
- use internal and external info (from vacuum system, Si stations)

Interlock:

- Will involve several levels of safety (hardwired, PLC's, …)
- exchange status info with vacuum system, Si stations control, etc.

VELO Control Systems

Tasks:

- Baseline design
  - motion mechanics — under way (re-design)
  - vacuum system — done (to be approved)
  - cooling system — done (to be approved)
- Define safety logic — started
  - motion mechanics — beam controls/alarms, where/how are the beams dumped, …
  - vacuum system — differential pressure, leaks, hardware failures, ...
  - cooling system — vacuum, Si status, ...
- Design control systems — started
  PLC-based → Jaap Kuijt, Luc Jansen
- Build and test control systems
- Control software, interfaces — by whom ? LHCb ECS group ?
  How ? What ?
  LHCb and LHC interfaces