# *Data Exchange for Vacuum System*

A. Rossi – V. Baglin – I. Laugier

Pressure measurement

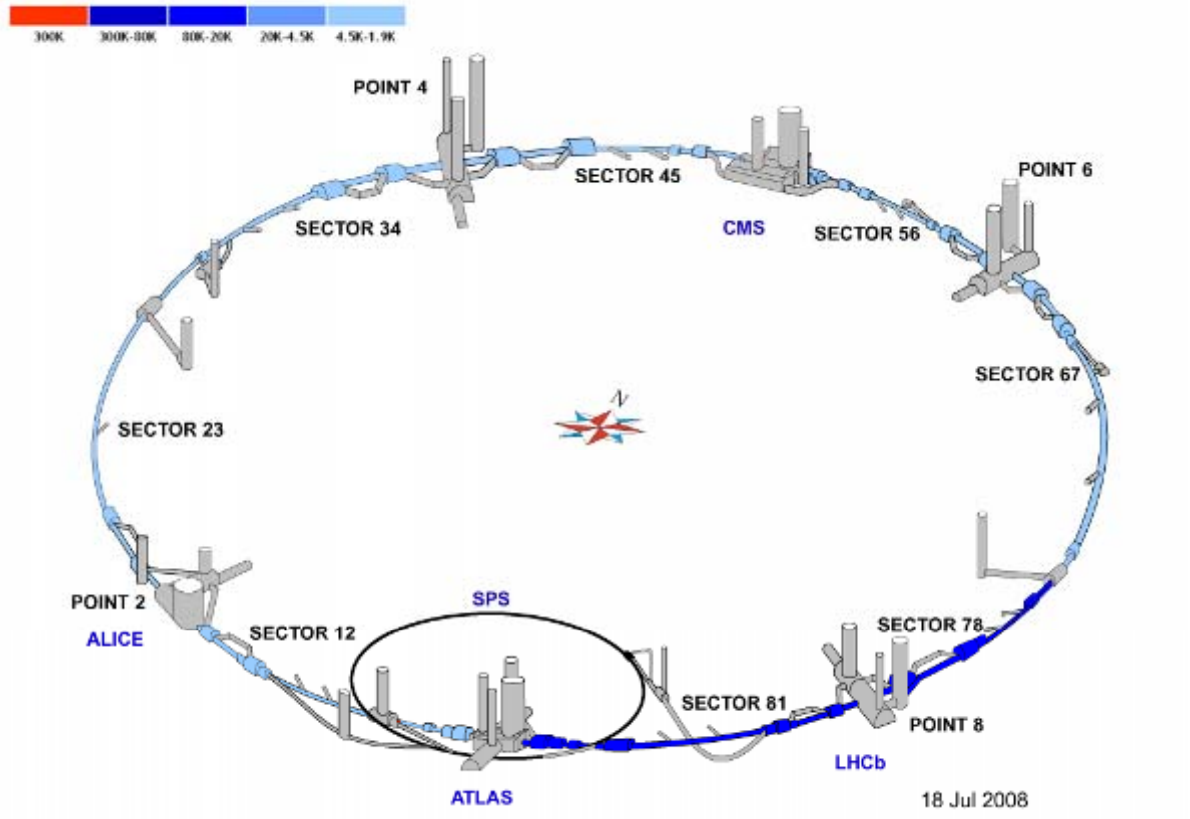
Gauges around the LHC

# *Pressure measurements*

| | | |
|---|---|---|
| Rough vacuum | 1 mbar < $p$ < atm | |
| Medium vacuum | $10^{-3}$ mbar < $p$ < 1 mbar | |
| High Vacuum | $10^{-7}$ mbar < $p$ < $10^{-3}$ mbar | Magnet insulation vacuum |
| Ultra High Vacuum | $10^{-12}$ mbar < $p$ < $10^{-7}$ mbar | Beam vacuum |
| Extreme High Vacuum | $p$ < $10^{-12}$ mbar | |

- UHV measurements with
  - Penning Gauges (VGP) - $10^{-4}$ mbar to $10^{-10}$ mbar
  - Ionisation Gauges (VGI) - $10^{-6}$ mbar to $10^{-12}$ mbar
- Both gauges reading are gas dependent (ionisation probability)
- VGI more sensitive, more accurate (all gauges in LHC calibrated)
- VGP reading depends on electronic cards low range limited to $10^{-9}$ or $10^{-11}$ mbar
- AT/VAC consulting is recommended before using measurements for quantitative studies

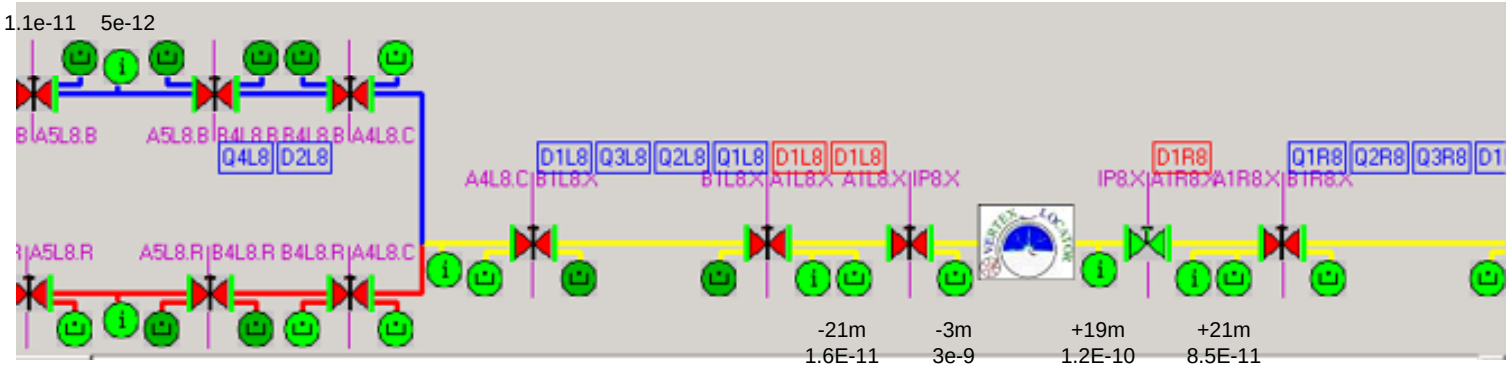
# *Vacuum instrumentation in LHC*




FOR ALL INTERACTION REGIONS

- Gauges up to Q7 (6250m from IP) at each sector valve (warm section)
- Gauges in the arc at Q15, Q23 and Q31 reading down to 5E-9 mbar but not below

# *Example of IR8*




Sector valves and UHV vacuum gauges

# *Present status and limitations*

- VGI: 55 % of VGI around the machine are working
- 45 % of VGI
  - Noisy read-out (cables or power supply current stability …) – 13%
  - Lack of power supply – 26%
  - Misfunctioning of power supply – 6%
- Consolidation ongoing, with priority to experimental regions

- VGP leakage current may give wrong read-out

# *DIP publication for Vacuum data*

- Generated from our PVSS application
- Few Penning or ionization gauges around Atlas and LHCb are actually published.
- Two parameters:
  - State: ON/OFF + Valid bit
  - Pressure in mbar as a float number.
  - Under range gauges have validity bit set with $5\ 10^{-9}$ or $1.1\ 10^{-11}$ mbar as Pressure values.