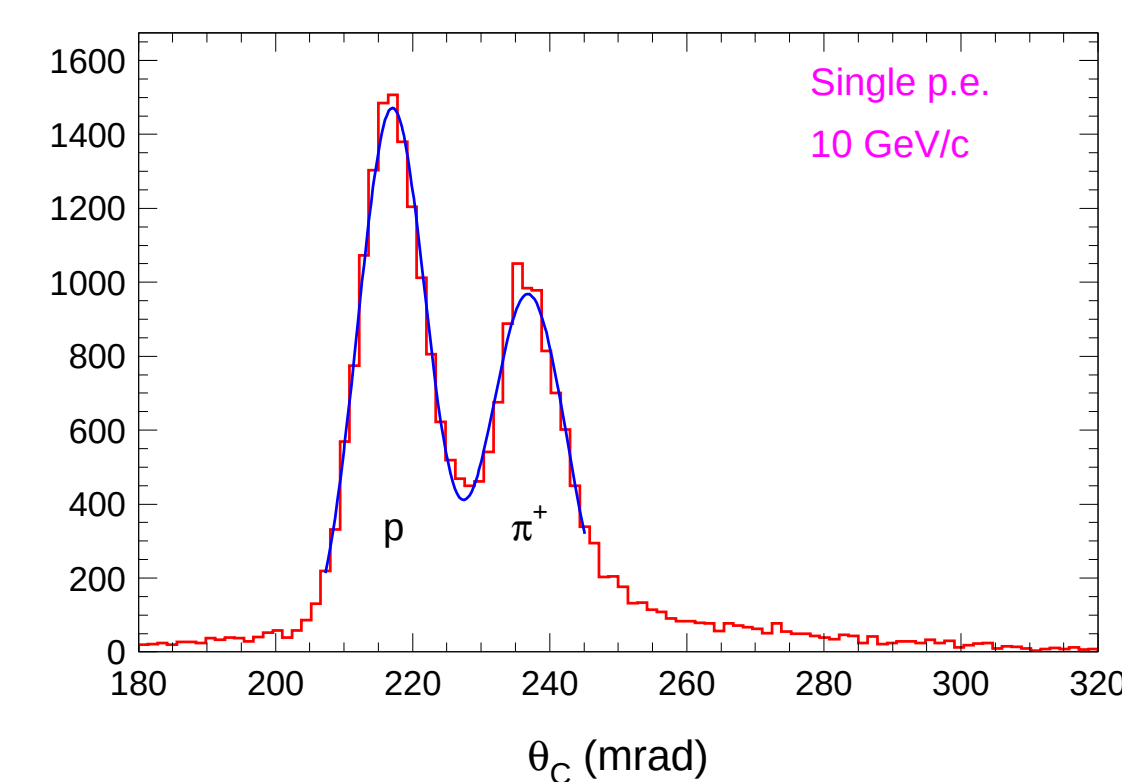
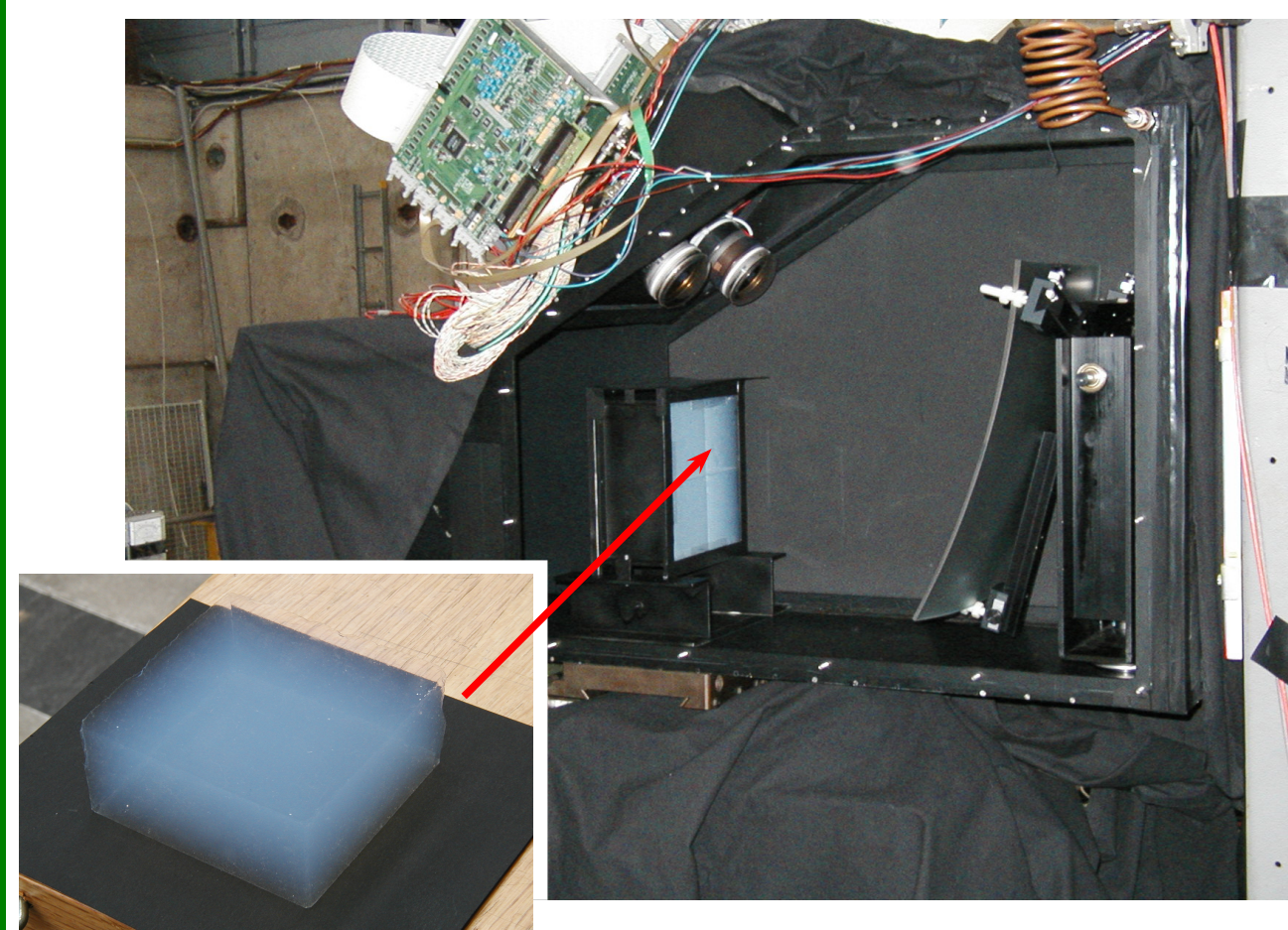


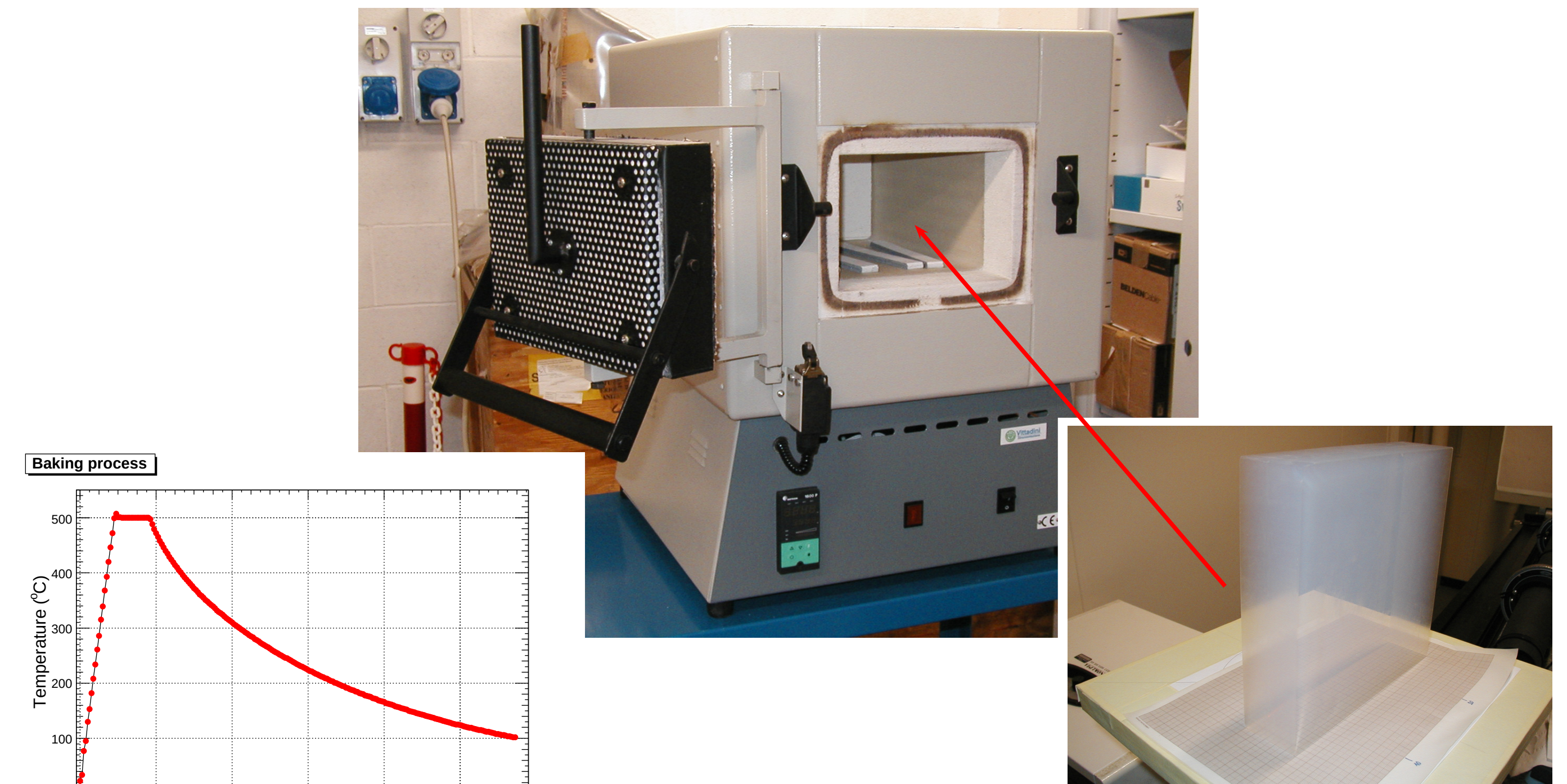
Silica Aerogel

- Hygroscopic linked network of SiO_2
- Density $\rho \sim 0.15 \text{ g/cm}^3$, tunable during production
- Clarity $\sim 0.0050 \text{ } \mu\text{m}^4/\text{cm}$, refractive index $n \sim 1.03$
- Produced by the Boreskov Institute of Catalysis, Novosibirsk
- LHCb equipped with $200 \times 200 \times 50 \text{ mm}^3$ tiles, the largest size ever
- 16 tiles needed for RICH1 detector of LHCb
- Good refractive index homogeneity $\sigma(n-1)/(n-1) < 1\%$
- Excellent π/p (5σ) and π/K (3.8σ) separation up to 10 GeV/c



Recovery Procedures

- Two possible methods to recover aerogel from non-destructive ageing factors (water, varnish, C_4F_{10})
 - exposure to dry atmosphere (gaseous N_2 or CO_2) for a few days
 - bake at 500 °C for several hours



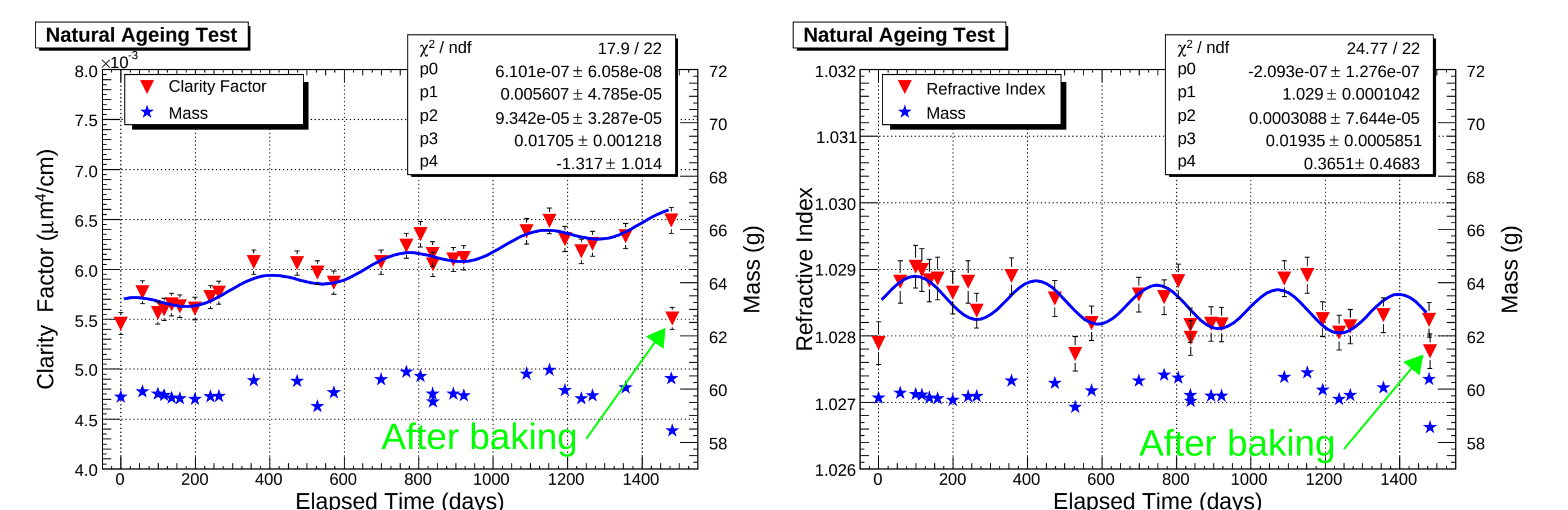
- 2 °C/minute to avoid cracks due to thermal stress

Ageing Effects and Long Term Stability

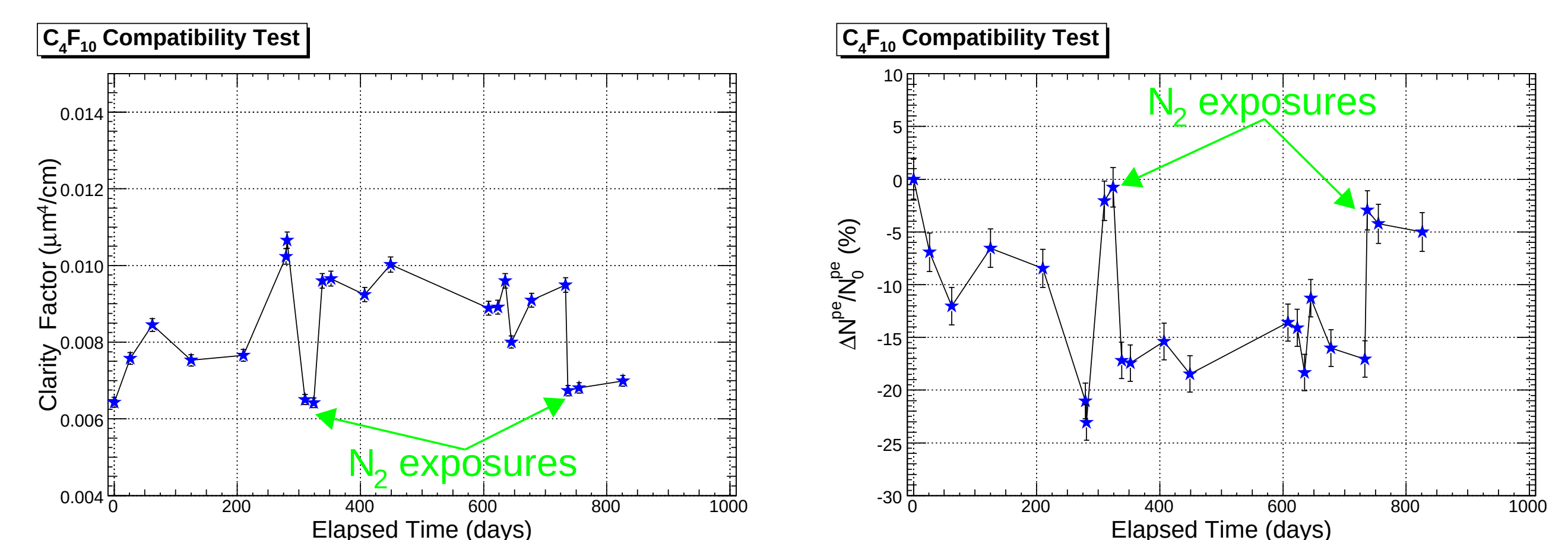
- Particle flux in the aerogel region $\sim 3.5 \times 10^{12} \text{ particles/cm}^2/\text{year}$
Can this harm the performance?
 - proton, neutron and gamma irradiation
 - total fluence corresponding to ~ 15 years of data taking
 - no evidence of ageing due to irradiation
- Hygroscopic sample exposed to humidity: degradation of its optical properties as expected, but in a reversible way!

- RICH1 varnish outgassing: a conservative test

- Natural ageing to check the stability: 4 years of monitoring!



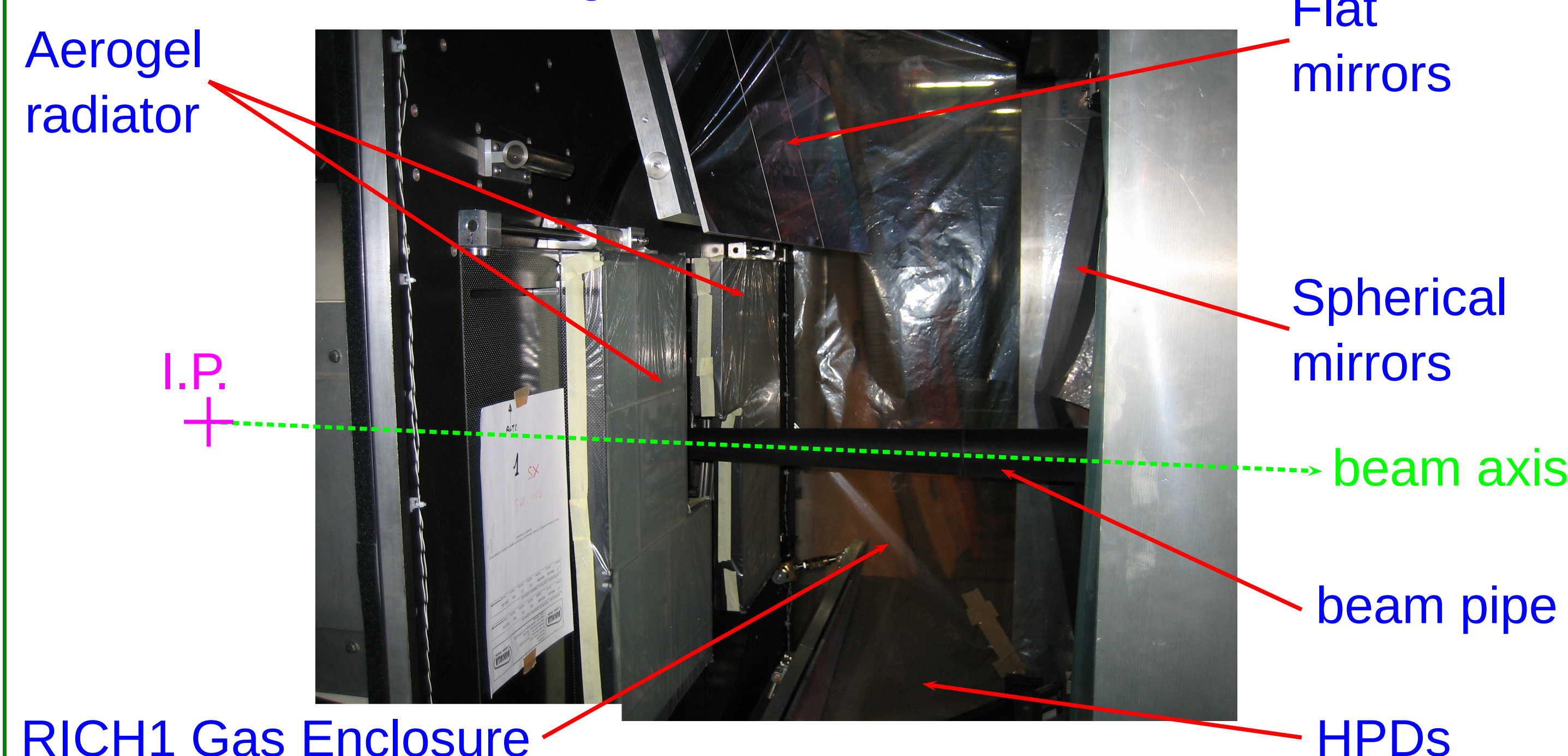
- Aerogel radiator in contact with the gaseous C_4F_{10} radiator



- Recovery by placing the aerogel in dry N_2 atmosphere

Integration of the Aerogel Radiator in the RICH1 Detector of LHCb

- Trial installation of aerogel into RICH1 detector



- Simulation of RICH1, showing generated Cherenkov photons

