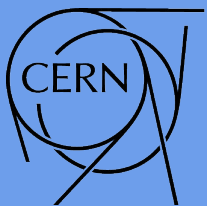




CMS HVAC Test RPC Gas Systems

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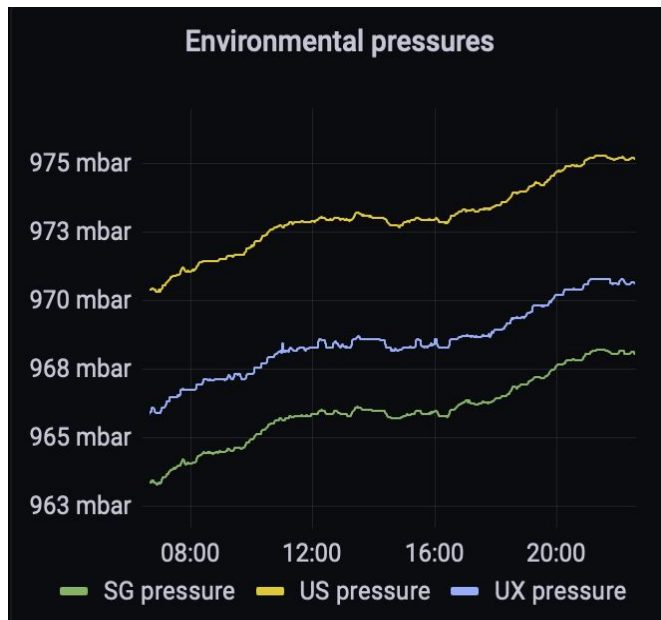
EP-DT
Detector Technologies

CMS HVAC Test - Cap Closed

- Test on 6th October 2021, various ventilation configuration with cap closed
- Cap closed modes:
 - **Access:** air circulation between inside and outside
45'000 m³/h extracted, 45'000 + 5'000 m³/h injected
in use 2 units, one to extract and one to inject
 - **Beam (no access):** air recirculation in the cavern
closed loop of recirculating air, only 1 unit running
- **Emergency mode** : can be triggered by ODH or magnet discharge alarm
90'000 m³/h extracted, 90'000 + 5'000 m³/h injected
in use 4 units, 2 to extract and 2 to inject
**before going in emergency mode, ventilation has to ramp down then restart*
- To move from one mode to the others, ventilation has to be stopped:
 - Ramp down : done in 20 minutes, cutoff at low ventilator working point
 - Ramp up : done in 20 minutes to reach new configuration

CMS HVAC Test - Cap Closed

- To move from one mode to the others, ventilation has to be stopped:
 - Ramp down : done in 20 minutes, cutoff at low ventilator working point
 - Ramp up : done in 20 minutes to reach new configuration
- Change of ventilation mode effect = variation in exp cavern pressure

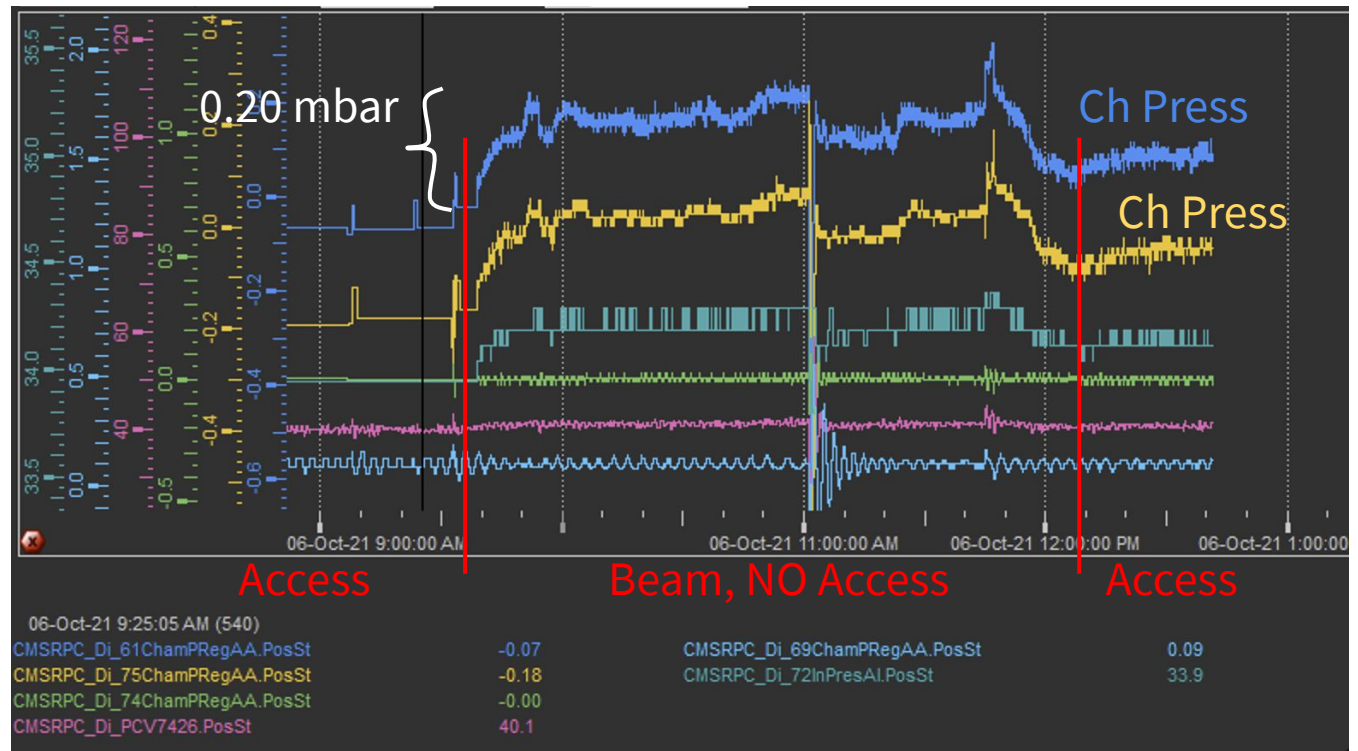


CMS HVAC Test - RPC Pressure

Full test duration, start and stop in cap closed Access mode

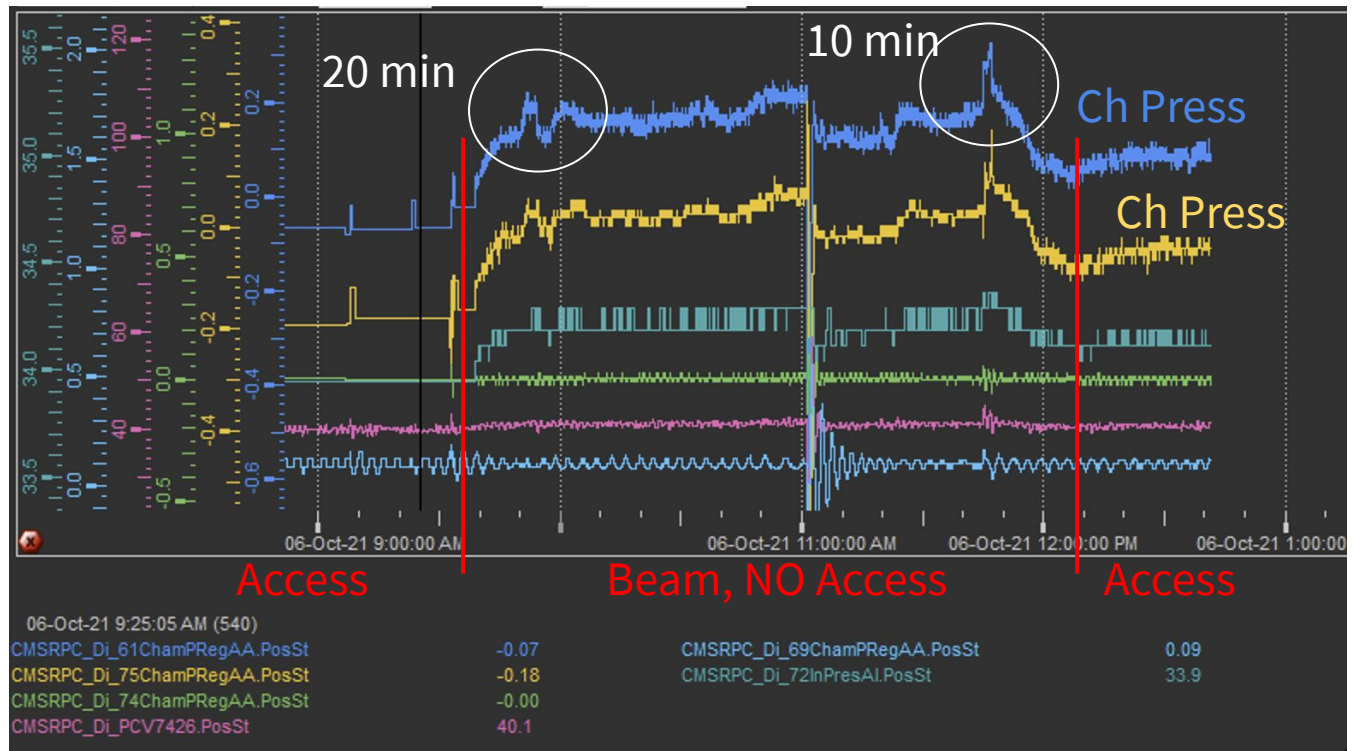
Monitored variables: RPC Chambers Pressure

- Difference of ~ 0.20 mbar in Ch Press between the two modes



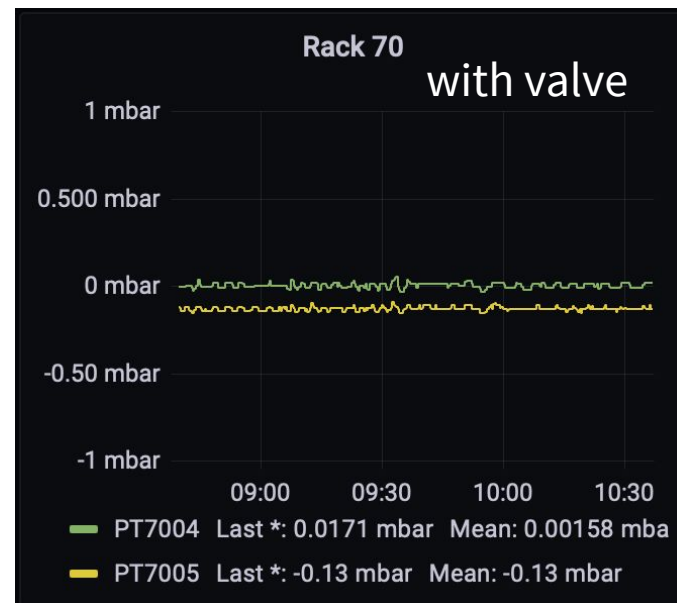
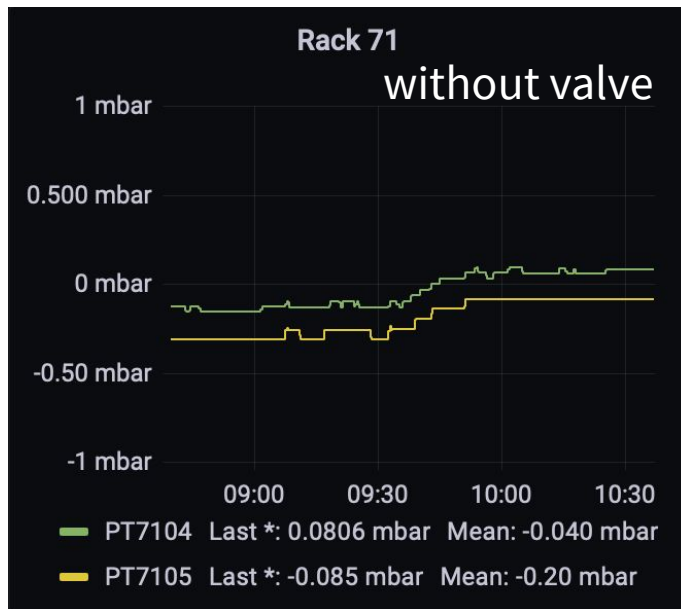
CMS HVAC Test - RPC Pressure

- Two ramp-up speed tested: 20 minutes and 10 minutes
- Ch Pressure variation during ramp-up, acceptable in 20 minutes, too much in 10 minutes >> *to be kept at 20 minutes*



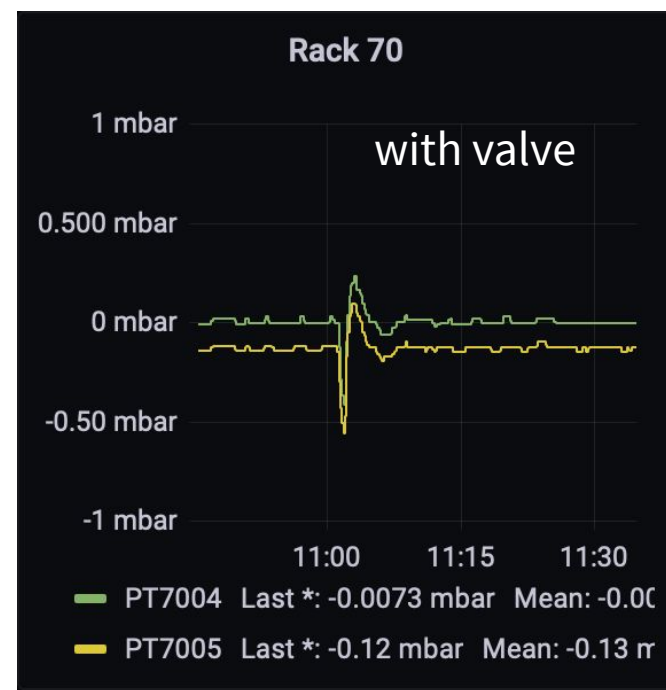
CMS HVAC Test - RPC Pressure

- Some RPC pre-distribution racks already have automatic regulation valves
- Ex: rack 71 is without valve, rack 70 already have ECONEX valve
- During change of Ventilation mode (slow variation in cavern pressure),
 - R71 Ch Pressure variation of ~ 0.20 mbar
 - R70 Ch Pressure is stable, compensated by automatic valve reaction



CMS HVAC Test - RPC Pressure

- BUT during problem in HVAC test, there was big and fast change in pressure
- Racks with regulation valve affected more than the others
 - R71 Ch : 0.50 mbar drop, recovered in 2 minutes
 - R70 Ch : undershoot 0.4 mbar, overshoot 0.2 mbar, oscillations from the valve, recovered in ~ 10 minutes



CMS HVAC Test - RPC Pressure

- If the valve regulation is not extremely well optimized, oscillations for large pressure drops are even more significant and take longer to recover



CMS HVAC Test - Emergency Mode

- Emergency mode not yet tested, safety does not like ventilation off before high speed extraction for OHD alarm
- EN will discuss internally on how to change parameters
- Possibly new test to be done when cap Open (less effect on pressure) and after installation of RPC regulation valves