VdC, etc.

CMS Week 060313-17
Barrel Muon DT Session

Vd Chamber, etc.

Hans Reithler / Aachen

Vd Chamber (1)

- **Aim**: measure directly and continuously the drift velocity Vd in the gas, as sampled from each chamber. Is part of the DT gas analysis (see e.g. CMS Muon TDR).

- **Method** (reminder, see Figure): measure drift time within a region of homogeneous electric field, using 2 Sr90 sources (used at L3 exp.) .

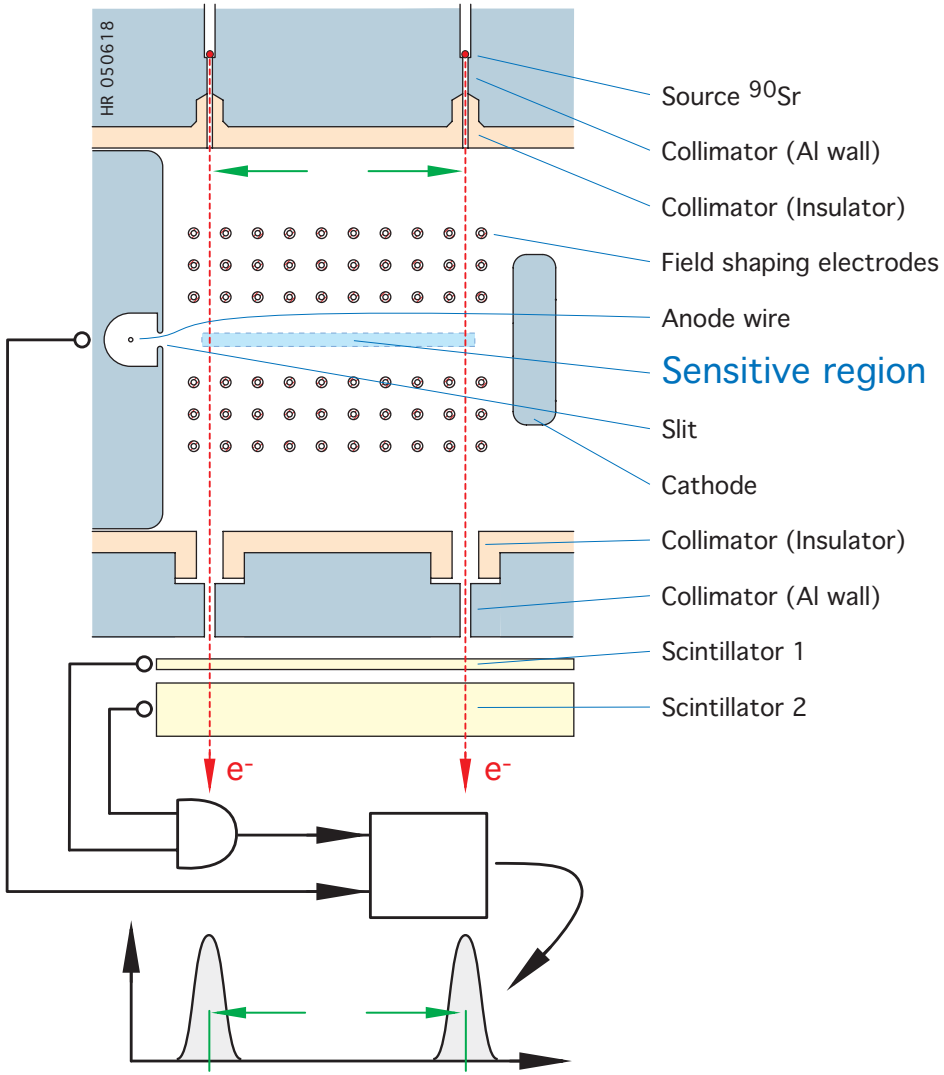
- 3 **Presentations** so far, at CMS Weeks:

http://www.physik.rwth-aachen.de/~reithler/talks_DT_050620CMSweek/DT_session/050620VdC_etc_HR.pdf
http://www.physik.rwth-aachen.de/~reithler/talks_DT_050919CMSweek/DT_session/050921VdC_status_GA.pdf
http://www.physik.rwth-aachen.de/~reithler/talks_DT_051206CMSweek/DT_session/051206VdC_HVC_etc_HRs.pdf

- **Project**:

Aachen (mainly design, constr., hardware, test):
F. Adamczyk, G. Altenhoefer, J. Frangenheim, J. Grooten, Th. Hebbeker, G. Hilgers, B. Philipps, H. Reithler, H. Szczesny, ...

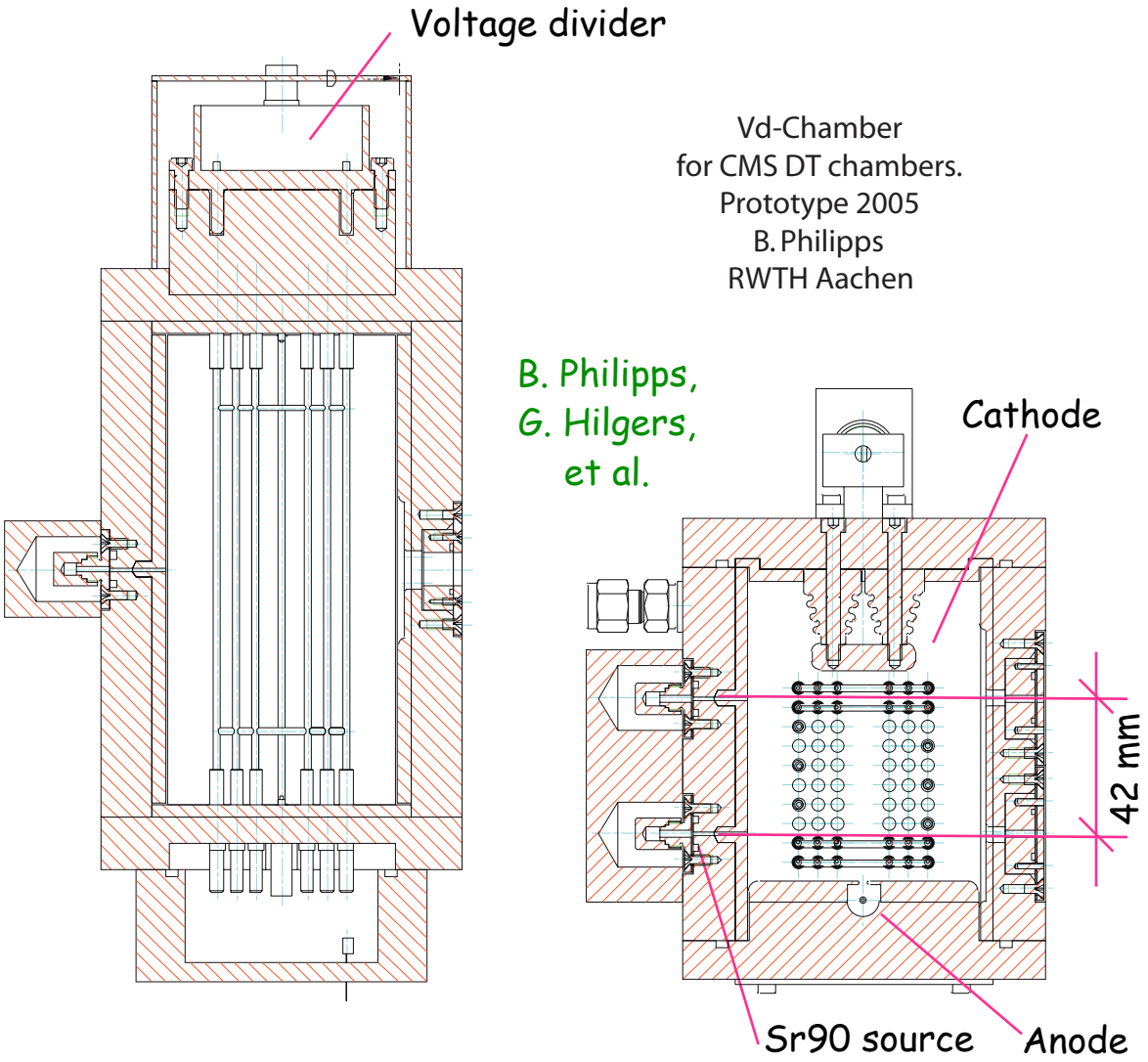
Debrecen (mainly DAQ sw., DCS integration):
G. Bencze, A. Kapusi, P. Raics, Z. Szillasi, G. Zilisi



Principle of the drift velocity measurement.

Vd Chamber (2)

Cross sections of prototype chamber

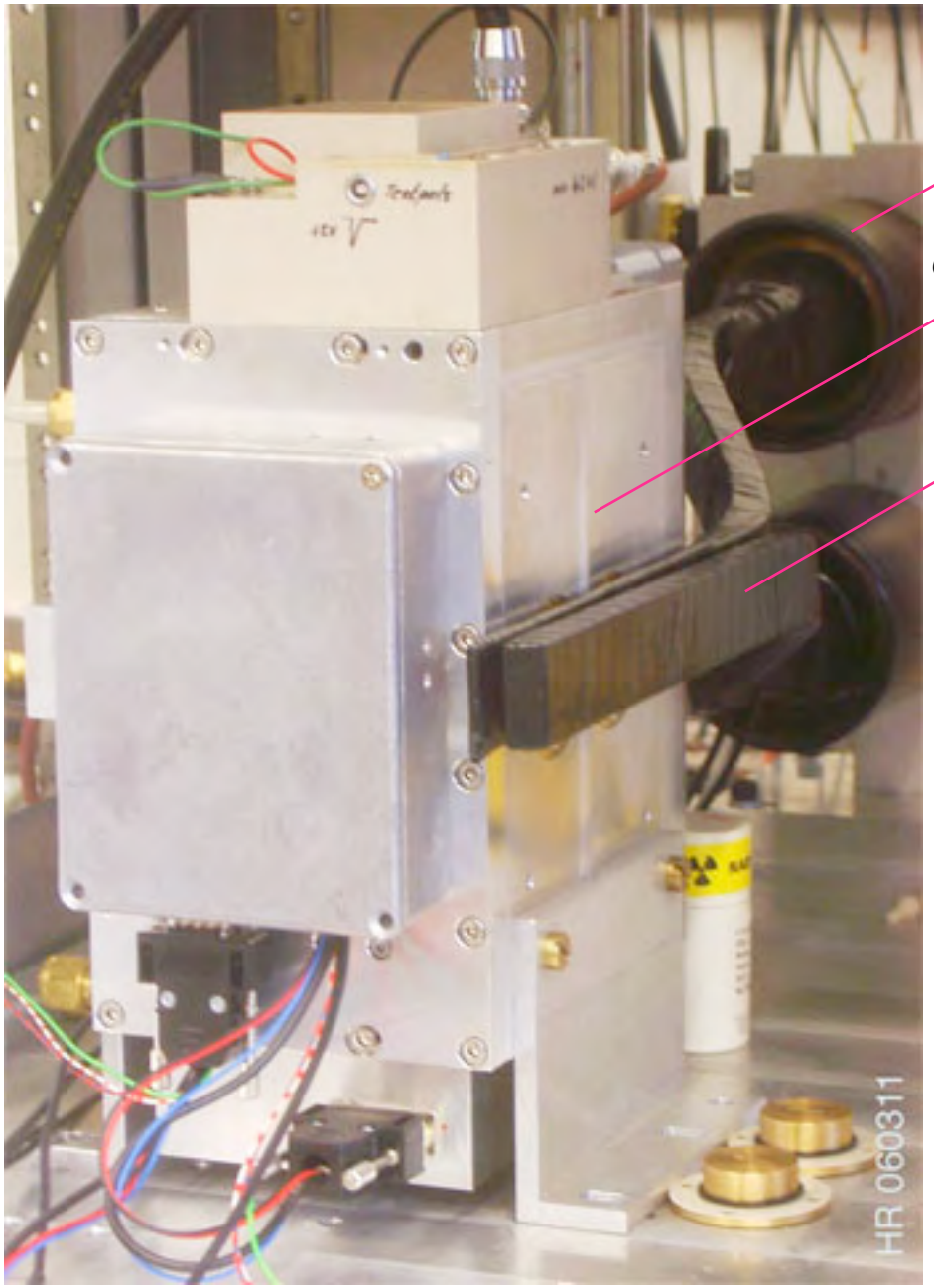


Vertical cut through Vd chamber. A precision voltage divider ensures a uniform electric field, for any cathode voltage.

Horizontal cut through Vd chamber. The inner layer of the chamber body is insulating, to permit the use of small gas volume and HV.

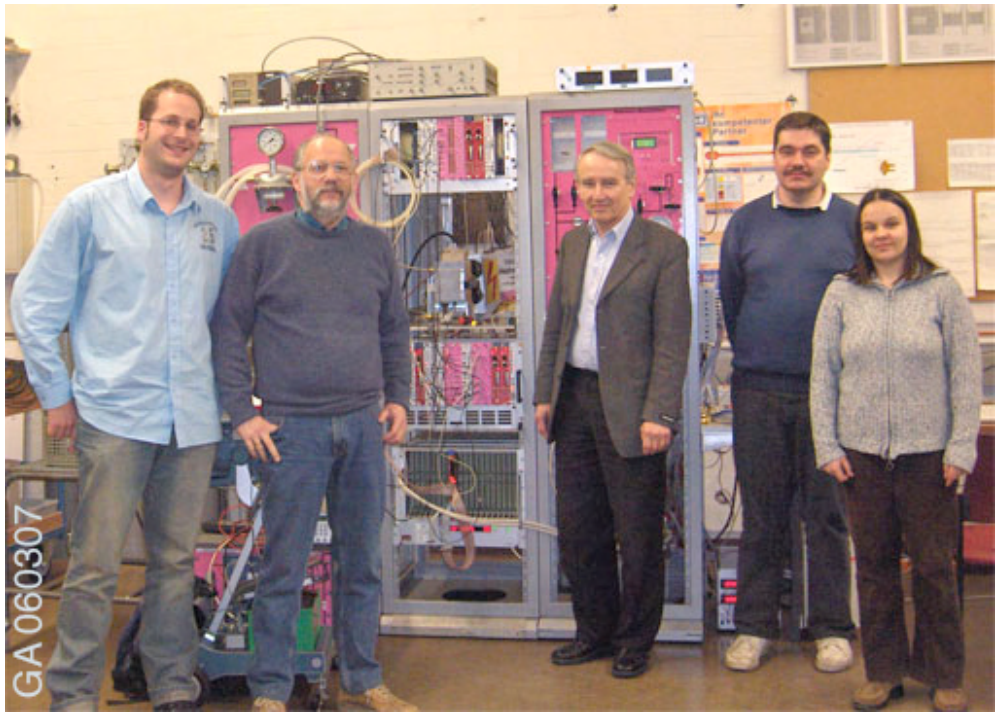
- **Prototype Vd Chamber**, as built at Aachen.
- **HV tests**, in gas: up to -13 kV are fine. Aim is max. of -15 kV.
- **Improved insulation** of HV feedthrough of field shaping electrodes. Further improvement t.b.d. at corner.
- **Delrin** probably superior to Peek, for insulating pieces (less carbonization damage, in case of a discharge along surface).

Vd Chamber (3)



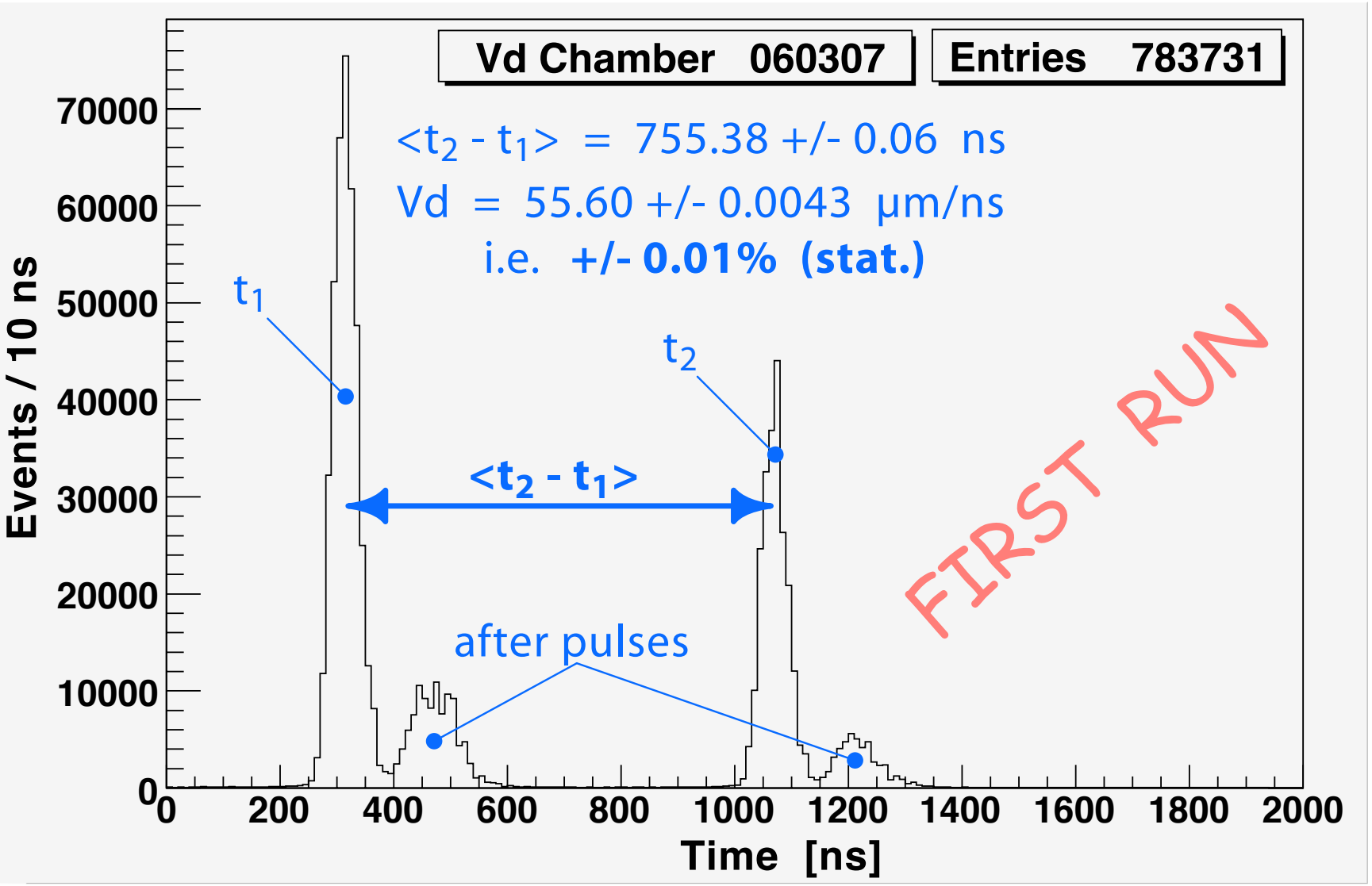
Close-up of Vd-chamber and trigger counters.

- **Recent history** of Vd chamber:
  - 0512: Chamber mech. assembly completed.
  - 0601, 0602: HV tests
  - 0602: Trigger counters tests
  - 0603: Anode signal, DAQ tests
  - 060307: First run of complete system, during visit of colleagues from Debrecen.



Vd-chamber system (central rack) surrounded by crew of first run 060307 (GA, GB, HR, GZ, AK).

Vd Chamber (4)



Drift time distribution, as observed 060307, at first run with complete Vd system.
Raw data plotted, no cuts applied. The after-pulsing of the anode signals is to be reduced, but has no significant impact on the main peaks.

- The **result from the first** run with the complete Vd system is astonishingly good. This is the **birth of the Vd chamber!**
- The **statistical error** above is already smaller than the systematic error from mechanical tolerances. Now watch and study systematic errors.

Vd Chamber Summary

Drift Velocity Chamber "VdC" to monitor gas of DT chambers

- Learned from prototype chamber tests:

  VdC system works.

  Thanks to the groups from Aachen and Debrecen.

- VdC system should be, as far as possible, available at start of CMS:

  decide now on "mass" production.

Next

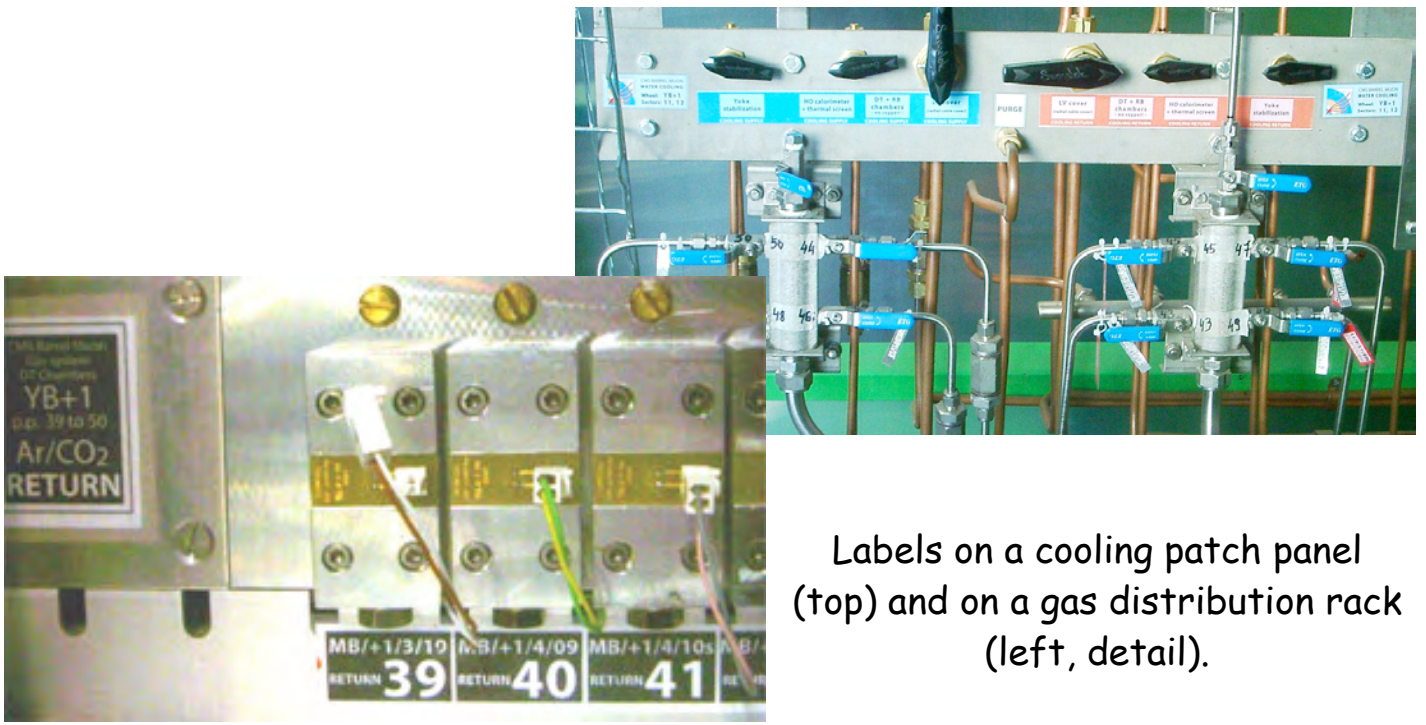
- Continue making systematic measurements/studies on prototype, in parallel to ordering material, constructing parts, adding ancillary components (temp., pressure, flow sensors), assembling system, further fine tuning, further development of software (DAQ, online data analysis, diagnostics, control, logging, ...).
- Aim: assemble and commission full VdC system and ship key-ready to CERN.

Other News

- **Interferences** on central wheel, of central services with DT chambers (see CMS Week June 2005; 10 interferences on +Z face, 12 on -Z face): on a meeting in 0601 A. Herve et al. stated that they are now all understood and removed (at least on paper; see today's presentation from A. Benv.). A solution for the removable central services is in progress, now (a connector was shown).

- **Expenditures** for **gas & cooling components on DT chambers**: are now approaching the end of assembly/dressing/commissioning/installation and have a better impression of costs for losses/tests and modifications (both beyond "first assembly" set). Main cost drivers are wider use of flexible tube (cooling) and repeated connections (gas/cooling for tests/ commissioning; small tightening components which can be used only once).

- **Labels**, for better orientation of all users when working on the wheels, were made and installed on all **cooling patch panels** and **gas distribution racks**. Further labels on chambers and on piping follow the chamber installation.



Labels on a cooling patch panel (top) and on a gas distribution rack (left, detail).