Cryomagnets Interconnections

- Connection Cryostats
- Consolidation of sector 4-5

Plug-in Modules
Photometer

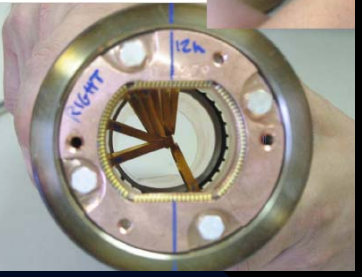
Leaks

Overview - Status

- SC-RP samples
- Quick interconnection overview

(Inter)Connection Cryostats Status

Sector	Repair of ICCs
1-2	Completed
2-3	Completed
3-4	R3 under closure now / L4 this afternoon
4-5	R4 and L5 opened ; end for W17
5-6	At next warm-up - 3 units
6-7	Completed
7-8	Completed
8-1	Completed



Consolidation of sector 4-5

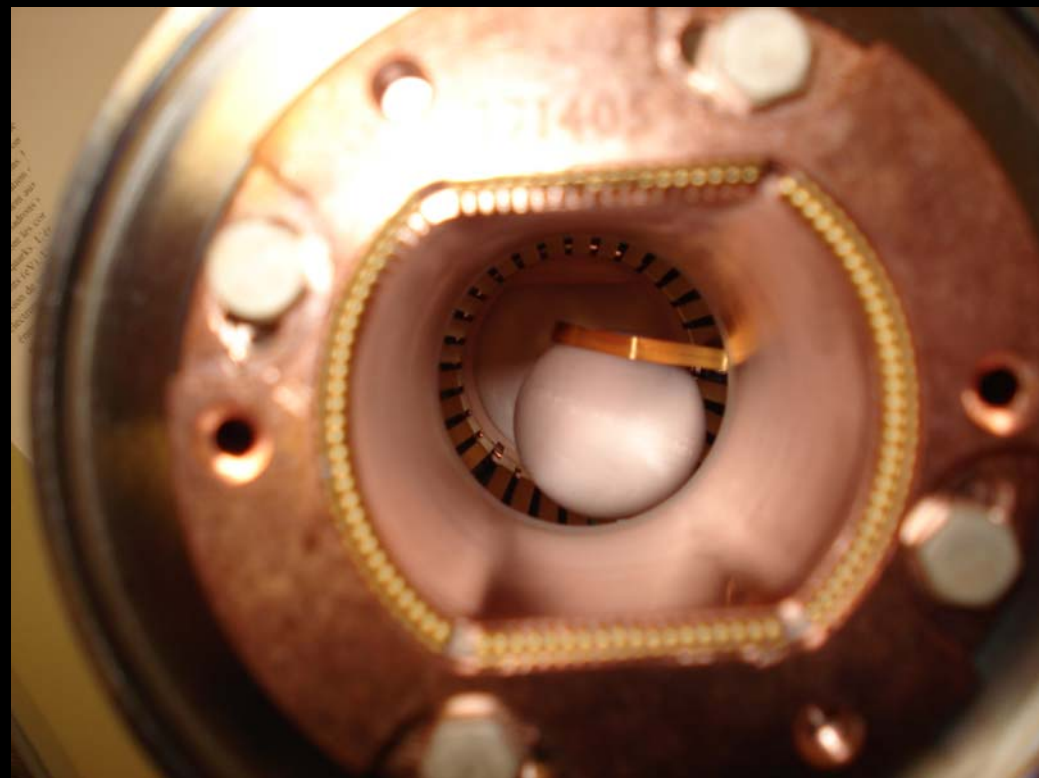
PIMs

All collapsed PIMs have been localised thanks to the Spoutnik test

- 12 collapsed PIMs in 9 ICs (3 ICs with both PIMs with deformed fingers)
- 10 ICs have been opened for this purpose
- Only QQBI (SSS-DIP) types are affected

BUT (1)

If only one PIM finger is deformed, the ball can nearly pass ….

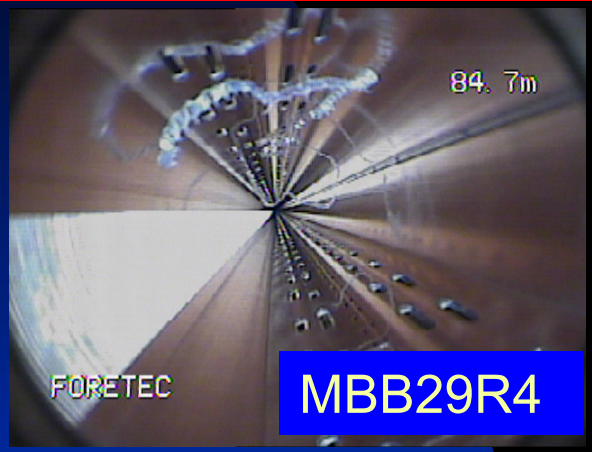


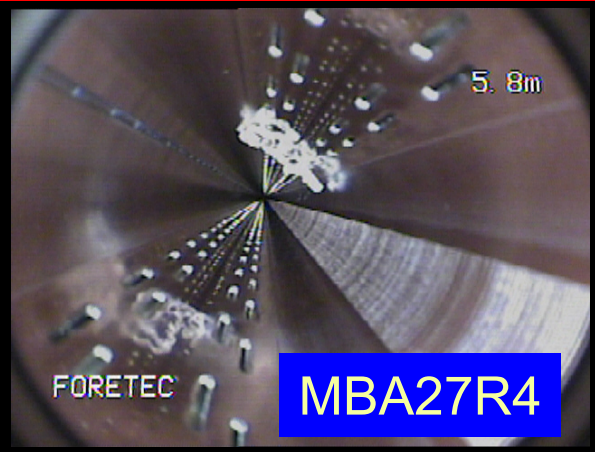
Consolidation of sector 4-5

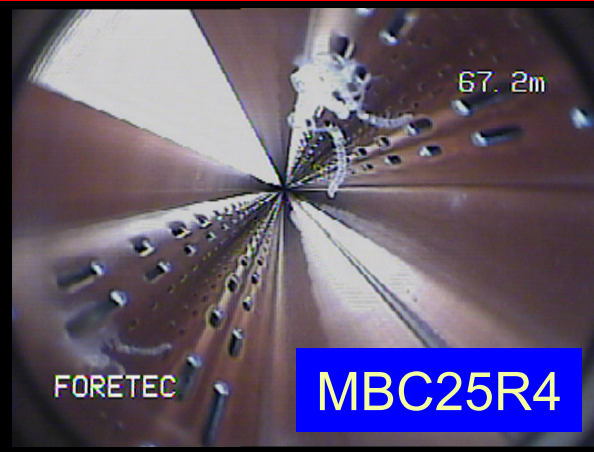
BUT (2)

PIMs

Thanks to numerous and careful endoscope inspections by the ICIT team, plastic pieces from beam screen packing have been found ; some of them were removed (sucking or crocodile pliers) and the other ones have “disappeared” / been displaced by air flows. If they are in the beam tubes, they are between Q30R4 and Q7R4 (All in V1)







Actions:

- Do nothing
- Fully inspect with endoscope V1 between Q7R4 and Q30R4 (4 ICs / 4 PIMs)
- **In addition, change also the twin PIM (4 ICs / 8 PIMs)**

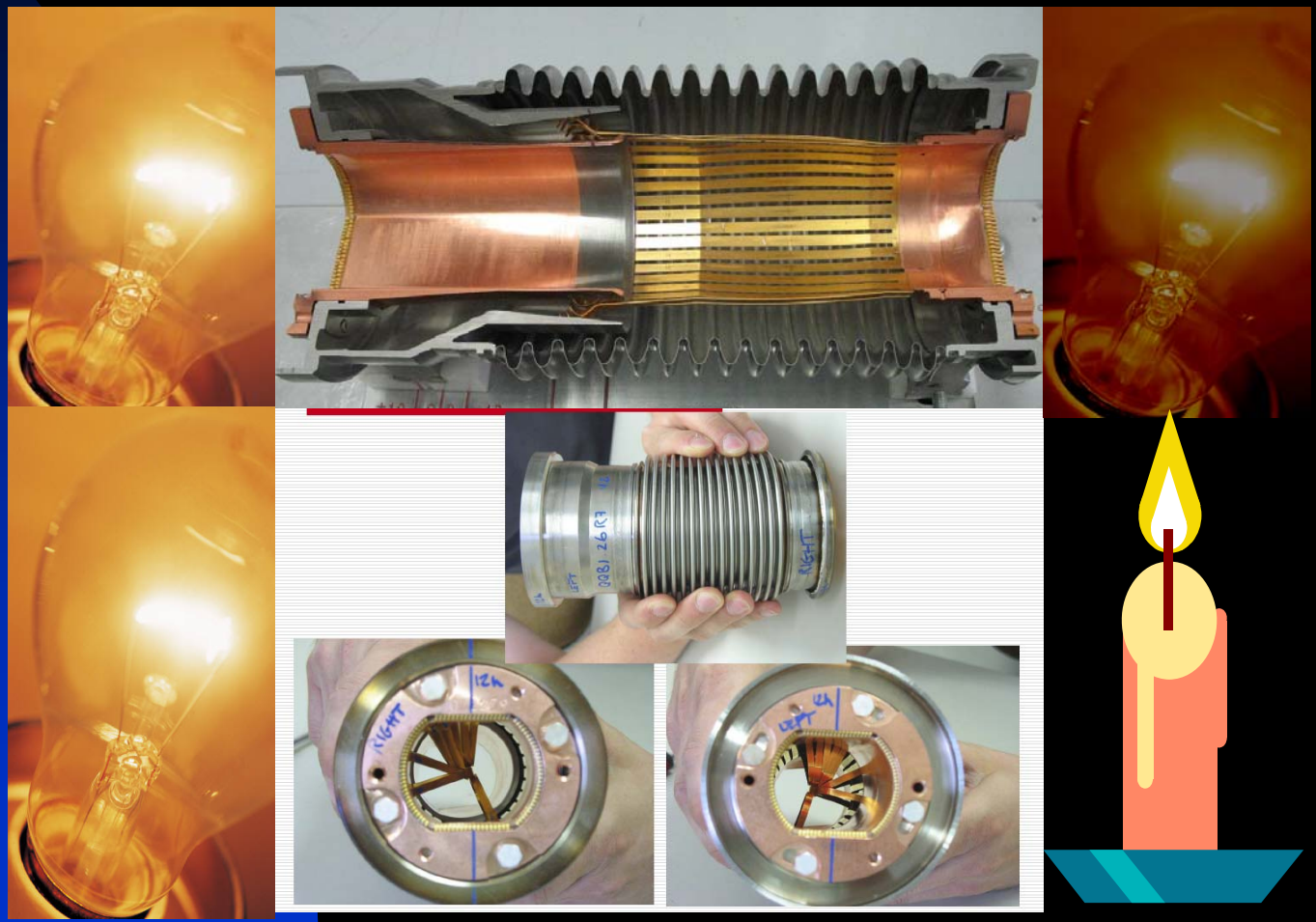
Up to there, still fits in the schedule

- Some magnets have not been inspected in the tunnel. Some were at the surface but as plastic pieces can move, this is not fully valid. Perform a full endoscope inspection (12 ICs/ 24 PIMs) ; this will add 2-3 weeks to the intervention time (Extra openings to remove pieces found and extra risk during leak test) [7-8&8-1 magnets were not inspected]

Consolidation of sector 4-5

Photometer test

The principle



Consolidation of sector 4-5

Photometer test

Characteristics of the method :

☺ No contact

☺ Feasible under vacuum (even less attenuation) – (45 deg mirrors and windows)

☺ Feasible at cold

☺ Sensitive to a single finger defect

😐 Sensitive to defect orientation

☹ No information on location of defect

😐 Relative information (complementary to other methods: Spoutnik,…)

☺ Good reproducibility (better than 5 % - can reach 1 % after optimisation)

☺ Quick method (speed of light – minutes)

? Is it feasible on a whole sector ?

If yes, can be used often, even with LHC in operating conditions for monitoring ; during cool-down and warm-up phases ; as a diagnostic method (no beam is passing); high benefit

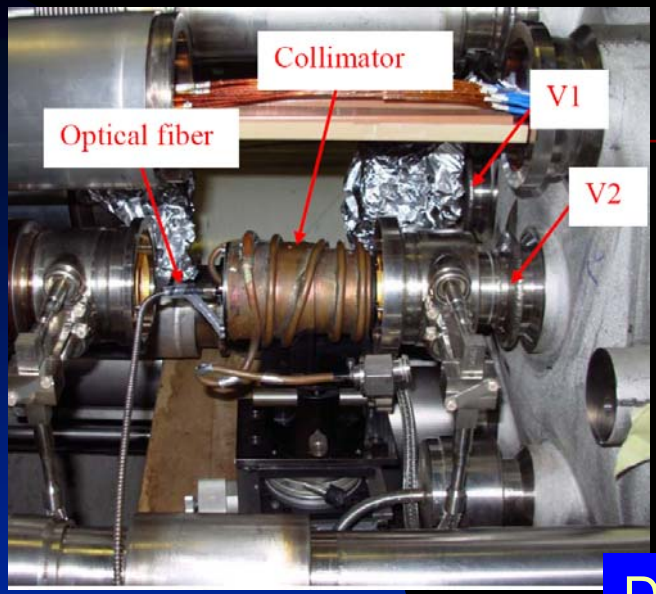
Make an intermediate test / Reassess feasibility

- Optimise the collimator (CSL)
- Use a better suited alignment device (CSL/CERN)
- Optimise baffling (CSL)
- Perform test on available openings in 4-5 up to 1 km
- Correlate with a corrected model (CSL)
- Finally assess feasibility, cost, lead time for a system to test a whole LHC sector

Consolidation of sector 4-5

Photometer test

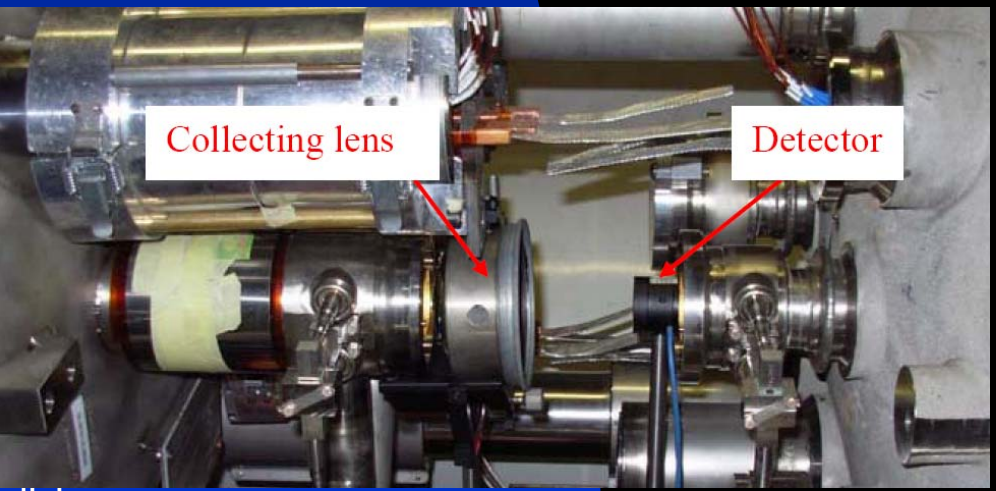
First test



Source

Second test

Detector



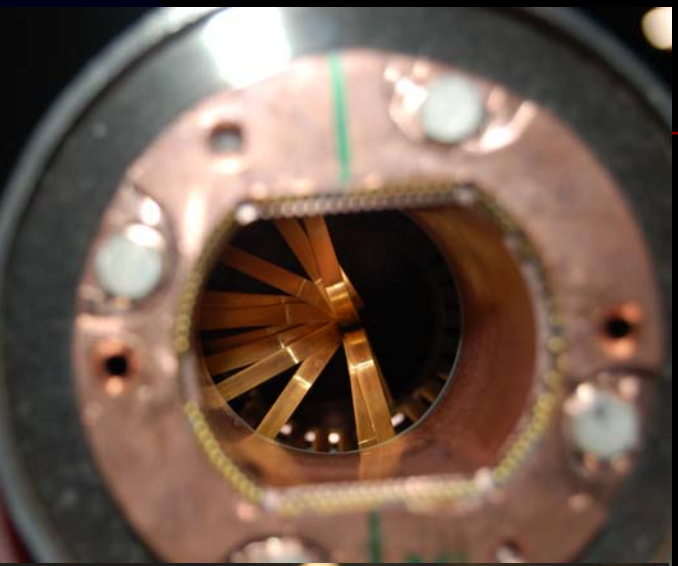
Photomultiplier

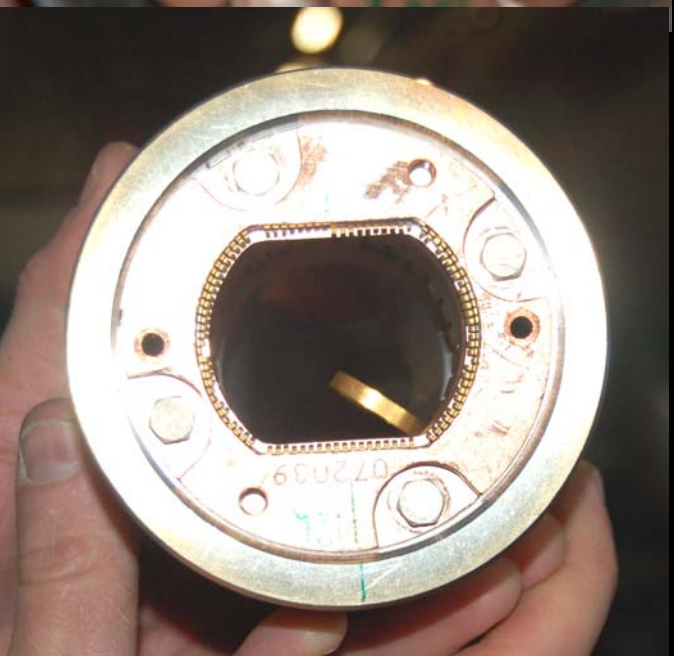
Photodiode

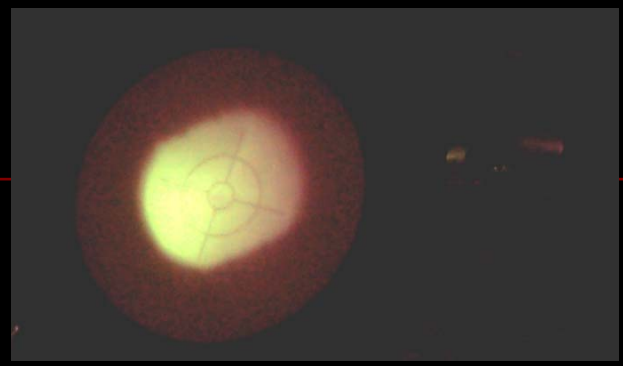
Consolidation of sector 4-5

Photometer test

Defects







Very preliminary results :

With the available set-up (not the most powerful), a defect with one finger can be seen on a length of more than 1 km ☺.

Possible improvements :

- Optimise wavelength
- Add adjustment devices
- More powerful laser source
- More sensitive detector

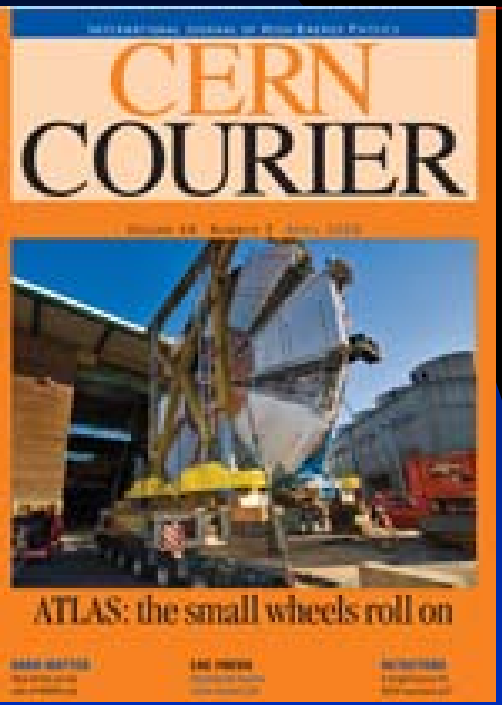
Further analysis is required but very promising

Consolidation of sector 4-5

Photometer test

CERN Courier April 2008

Astronomers find galaxy at record distance



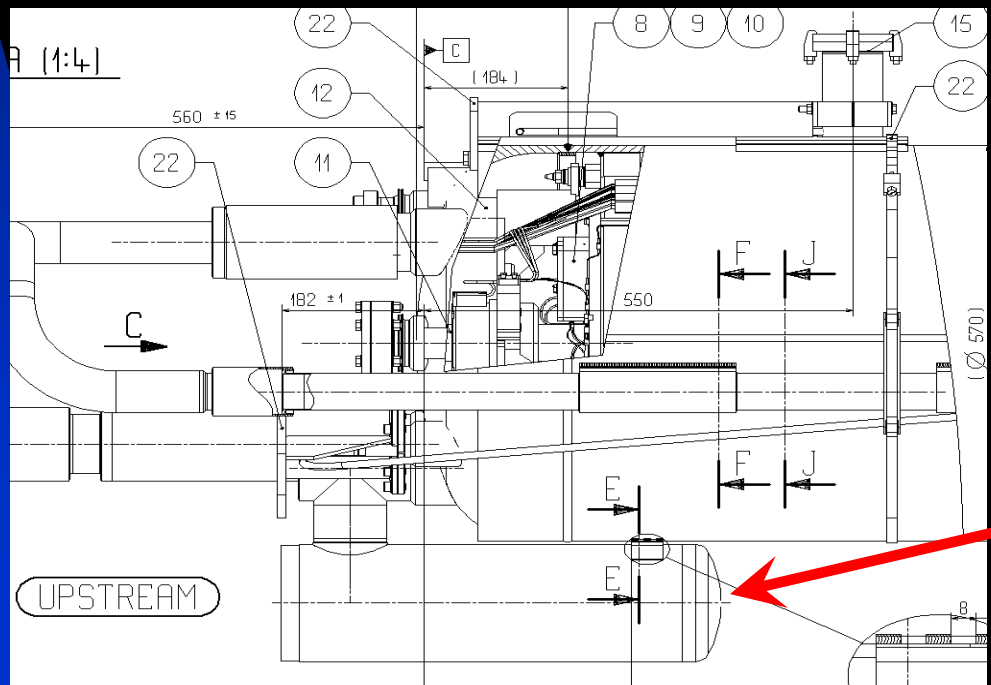
" The source was unseen with the Hubble Advanced Camera for Surveys at wavelengths shorter than 850 nm, but is detected with high significance (8σ) at 1.1 μm by the Near Infrared Camera and Multi-Object Spectrograph"

Consolidation of sector 4-5

Leaks

Interventions :

1. VACSEC 7R4 (NC847504) – CM leak to insulation vacuum of 1 10^{-5} mbar l /sec
   Localised on diode box container inner side (flat end ; accepted and tested) ; validated new container under welding – removed container will be leak tested
2. VACSEC 15R4 – C' K leak to insulation vacuum of 6 10^{-6} mbar l /sec
   Disappeared during localisation ; leak not present anymore
3. Check of beam lines leak tightness : OK
4. Q17L5 and Q29R4 (NC 826696 and 820313) – leak air to insulation vacuum – temporary solution now but to be consolidated by AT-VAC during re-pump down phase



Consolidation of sector 4-5

Sector 4-5 Consolidation			Schedule	Remark
1	Plug-in modules	12 failed PIMs localised / 20 cut	Critical	Extra openings for plastic pieces removal
2	Photometer test	Completed	OK	Positive results / To be analysed
3	Y lines	3 reinserted / one extra leak	OK	In IC in all cases
4	Helium guards	20 to be repaired / 60 % done	OK	Not a priority
5	Leaks	1 disappeared / 1 under repair	OK	Diode container under rewelding
6	Triplet 5L	Jumper cryolines under welding	OK	DFBX/Q3 IC under closure
7	Q5R4	Short repaired / Under closure	OK	Radial motion not yet understood
8	Connection Cryostats	Electrical insulation reinforced	OK	Under closure
9	CC splices	Not critical	Done	
10	DFBs cables	Not to be done	NA	

* Re-closure of ICs has started (#2)

* Will be on schedule and all activities completed if number of extra PIM openings is not exceeding 4 ICs (8 PIMs)

Insertion of Material Samples for the Experimental Verification of Induced Radioactivity

L Ulrici/ L Nicolas SC/RP

Waste Zoning :

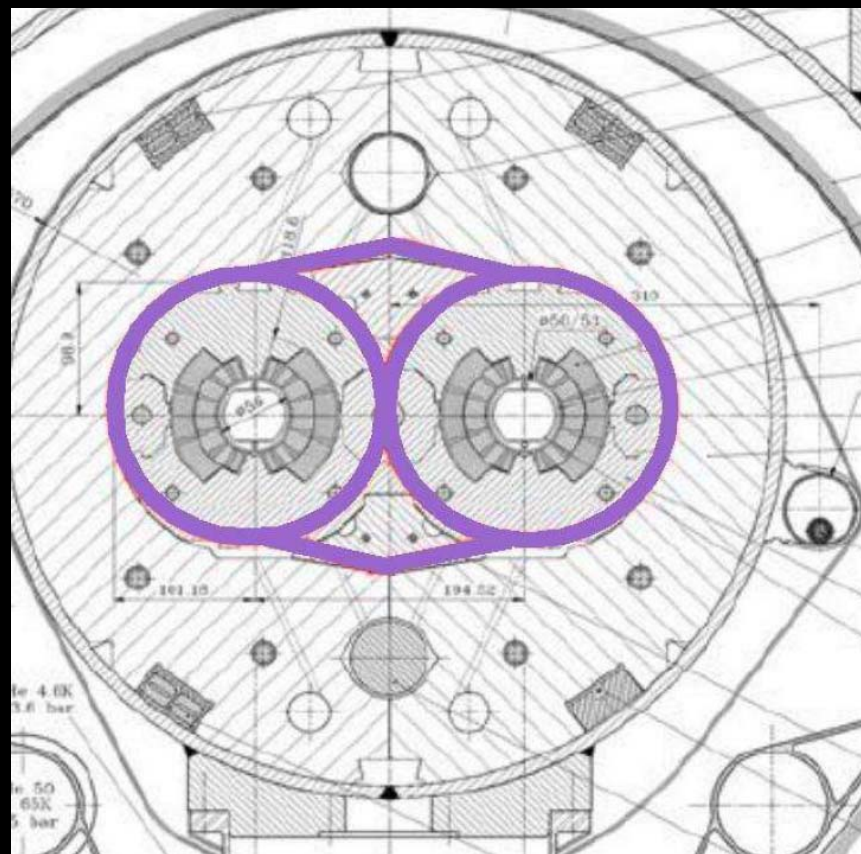
Zone de Dechets Conventionnels (ZDC) / Dechets Radioactifs (ZDR)

This impacts the treatment of the concerned items

The measurement of the induced radioactivity during the first years can :

1. Be useful for maintenance on parts
2. Help to estimate the final waste zoning
3. Provide a comparison with models

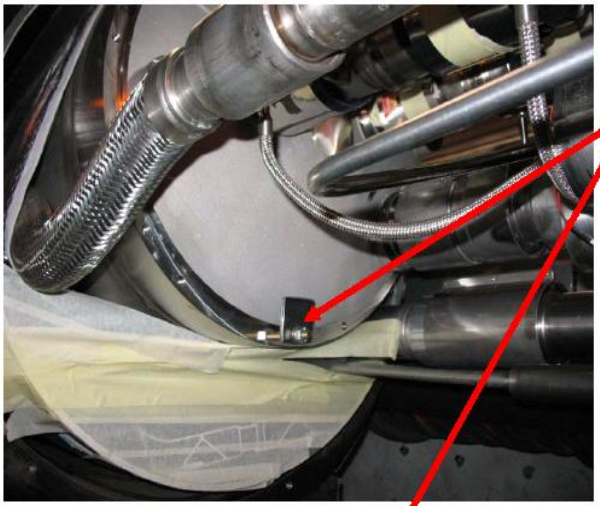
4. SC-RP proposes to introduce samples in the LHC environment to allow experimental verification



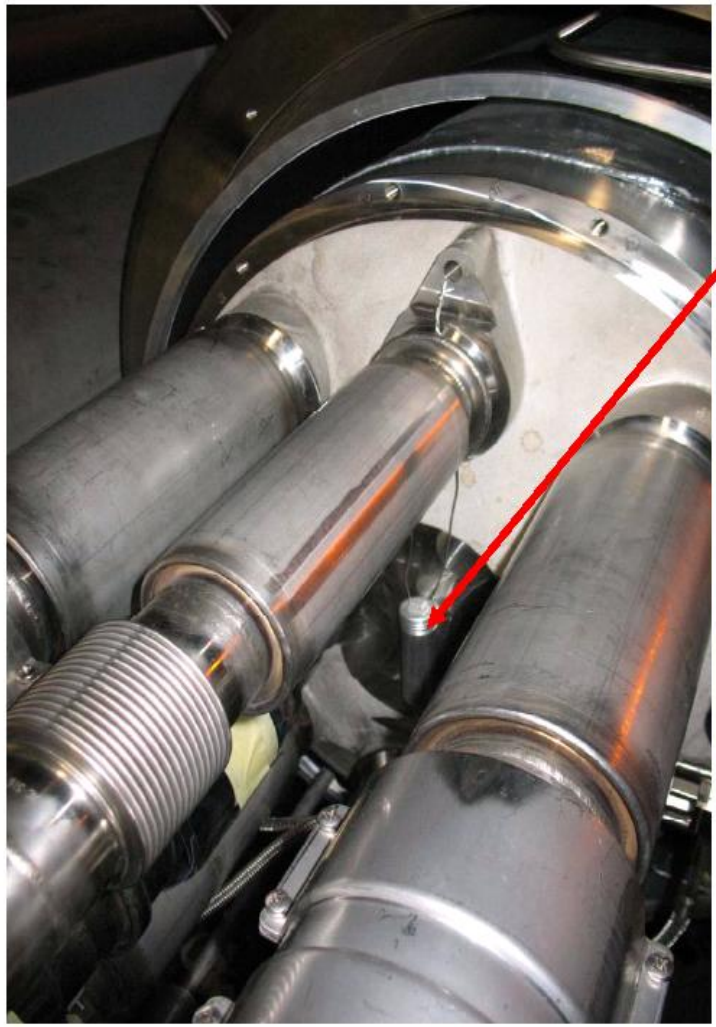
Insertion of Material Samples for the Experimental Verification of Induced Radioactivity

L Ulrici/ L Nicolas SC/RP

Engineering Change Request LHC-LI-EC-0001: under circulation



Half yoke samples, fixed with stainless steel threaded rod (M10x100mm), 3 washers and 3 nuts.



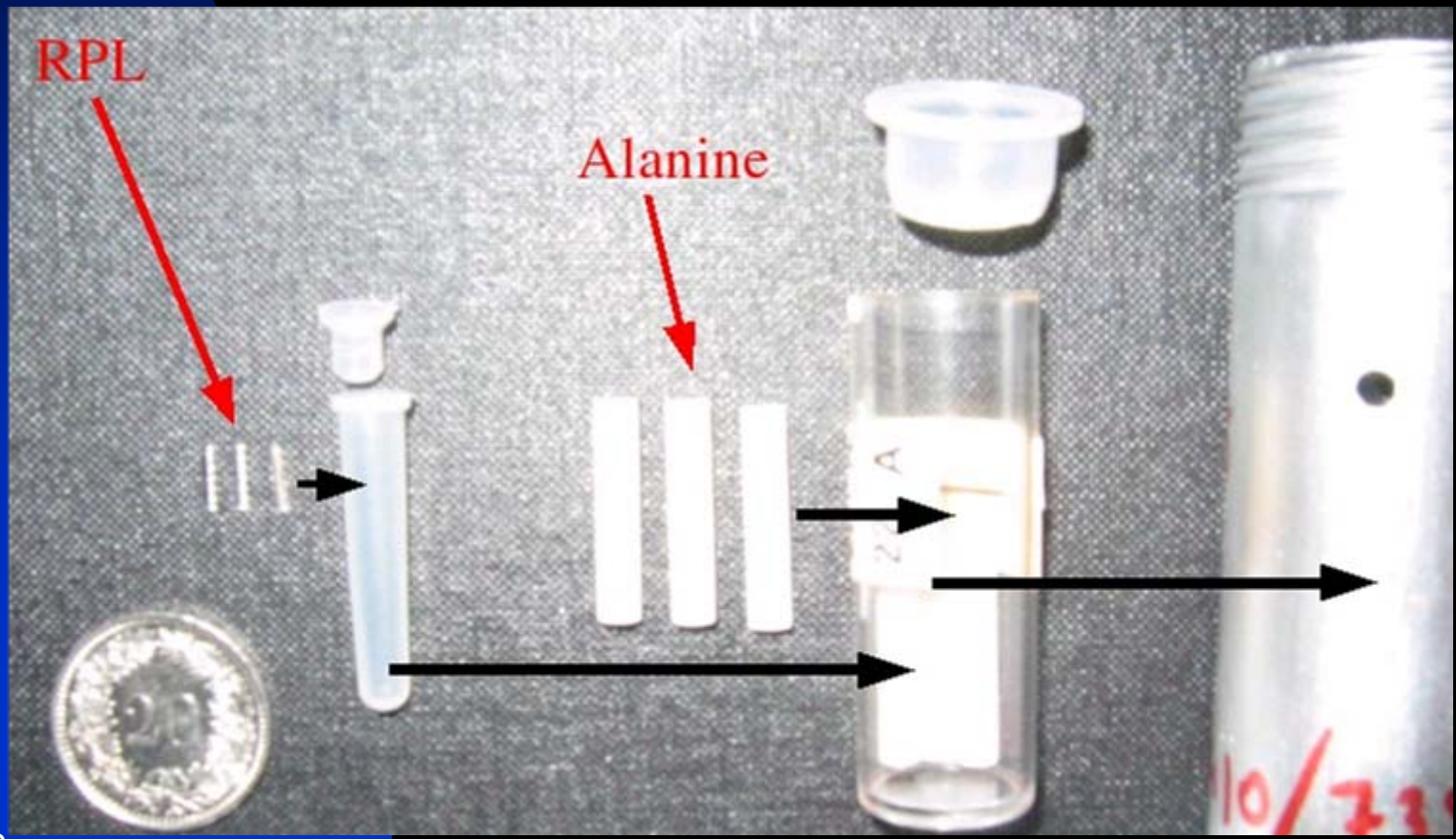
Cylindrical aluminum box with pass-through 3mm holes, fixed with stainless steel cable to X-line.
It shall be positioned between the two beam lines.
Inside there are: Dosimeter, collar coil sample, superconducting cable sample.

Insertion of Material Samples for the Experimental Verification of Induced Radioactivity

L Ulrici/ L Nicolas SC/RP

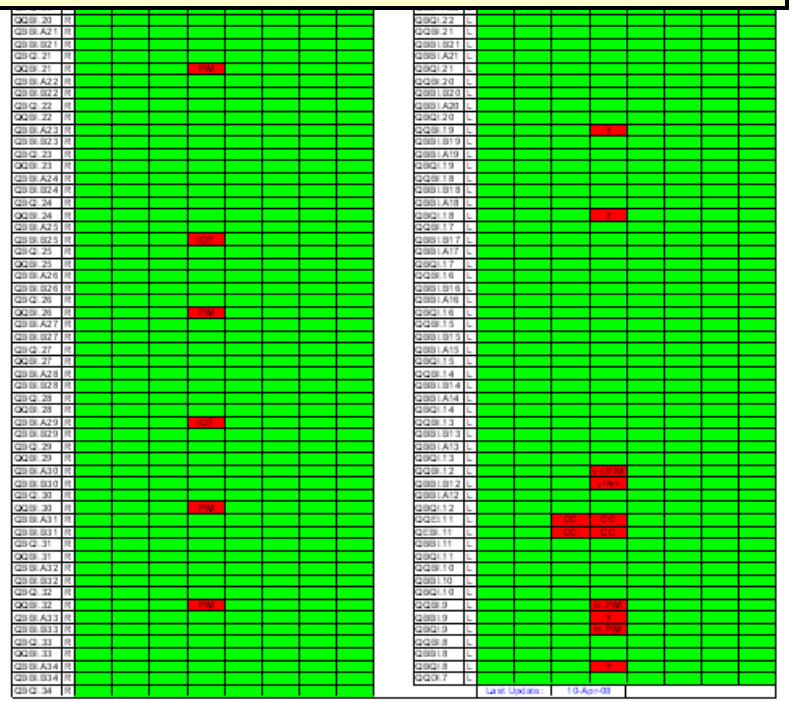
Comments:

- - VAC recommendations taken into account (Cleaning, venting holes, material, avoid Cl & S, …)
- - ferromagnetic materials close to the beams, even though they have small mass, does not create unacceptable field perturbations (Will be computed or non ferromagnetic material used)
- - Other materials could be put (Kapton, strand to measure critical current,…)



Quick IC overview

Sector	On-going
1-2	Short circuit (Q19L2) repaired, IC closed, Elec&L Tests on-going
2-3	Preparation for CD
3-4	Repair of ICC completed today
4-5	Consolidation
5-6	Cold
6-7	Cool-down
7-8	Cool-down
8-1	Cool-down



33 ICs opened:

29 in the arc:

2 for CC, 27 in 4-5

4 in LSS : L5 triplet

DFBX/Q3 + 2 jumpers

Q5-D4 @ R4