



Cryomagnets Interconnections

- ❖ Status of the helium guard repair

- ❖ Interconnection cryostats

 - Geometrical displacement

 - Status

 - Was also presented at ICC 15/02/2008

- ❖ Update on sector 4-5 consolidation

- ❖ Quick interconnection overview

 - Open points



Helium guards repair status

Sector	To be replaced	Done	Remark
1-2	24	12	Completed
2-3	9	8	Completed
3-4	3	3	Completed
4-5	8 ?	0	During shutdown of 4-5
5-6	13 ?	0	After warm-up
6-7	25	25	Completed
7-8	7	7	Completed
8-1	1	1	Completed

- * Components for second part of sector 4-5 and 5-6 are ordered ; delivery has been postponed to W9 ; still OK with the schedule but to watch
- * Endoscope inspections done in all sectors but 4-5 and 5-6
- * Under control



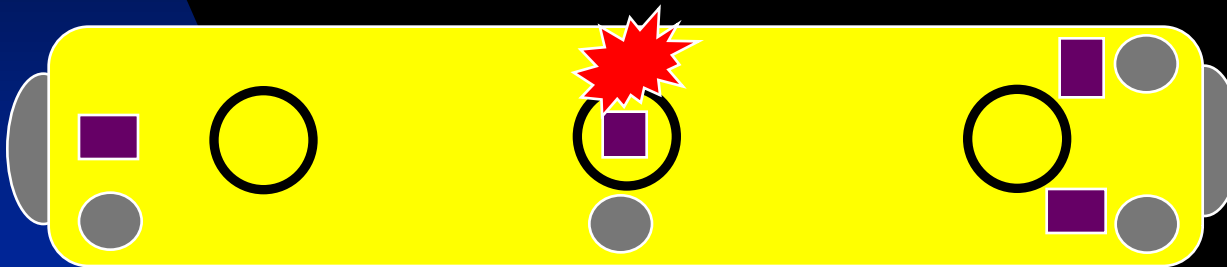
Interconnection Cryostats Update wrt ICC 15/02/2008 : Geometry problem

Tolerances :

From LHC-LE-ES-0001 rev 3.2

“Centreline of cold bore inner surface has to be kept all over its length inside a cylinder of radius 1.6 mm aligned on the beam theoretical position for aperture reasons.”

But more critical on Q11 side ; relaxed by about 1 mm at the other extremity (B Jeanneret)



4 Jacks (as for cryodipoles)

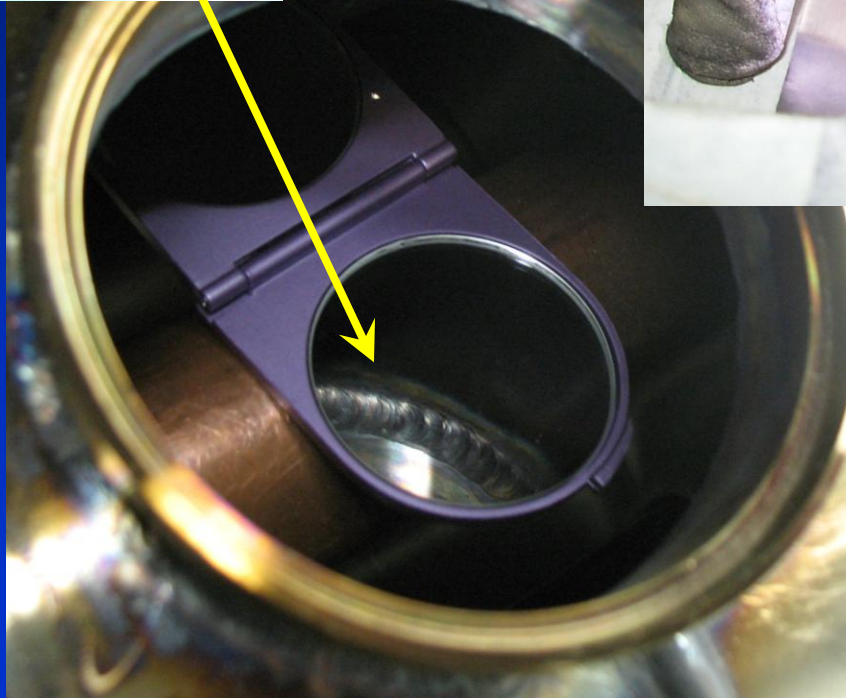
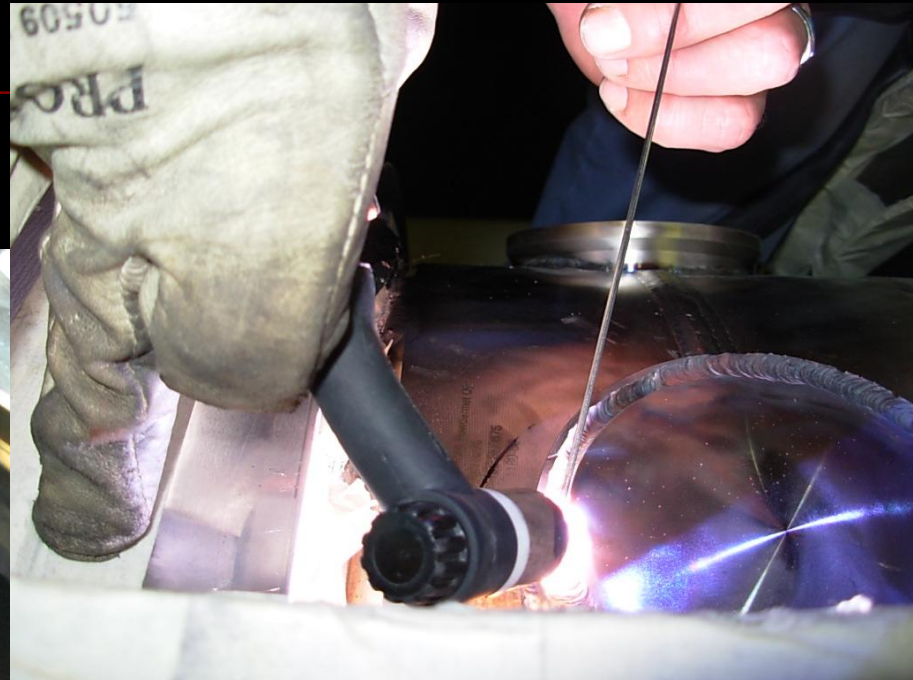
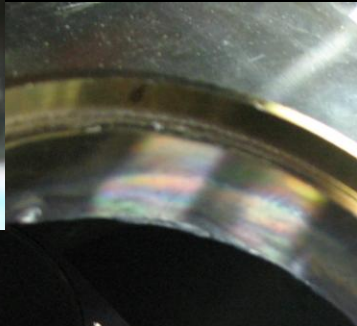
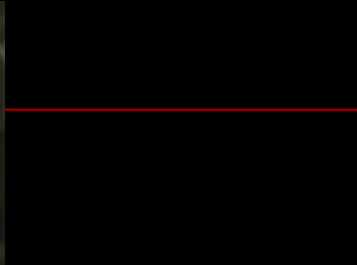
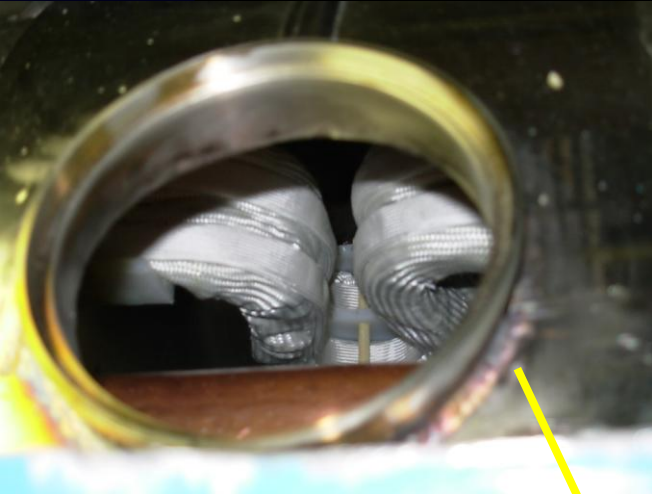
3 Support posts ; central one blocked (as for cryodipoles)

4 fiducials (as for cryodipoles)



Interconnection Cryostats Update wrt ICC 15/02/2008

Welds to re-close the shuffling module





Interconnection Cryostats Update wrt ICC 15/02/2008

Welds to re-close the vacuum vessel

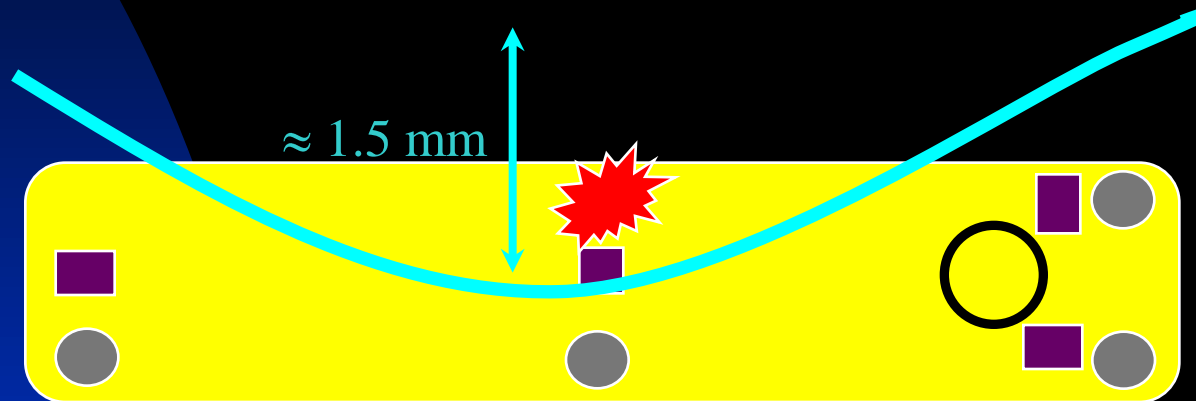




Interconnection Cryostats Update wrt ICC 15/02/2008

Sequence of events :

1. Measurement of fiducials of CC L8 before intervention
2. Measurement of displacement in SM18 on a test cryostat after reclosure of a vacuum vessel
(Displacement of about 1.5 mm)



3. Measurements taken with Romer Arm (TS-MME) in 7-8 to have references :
 - Displacement of SM wrt cryostat for SM welds,
 - Measurement of extremities of CC wrt neighbours ; done for R7 and L8
- Trials to compensate by welds on the other side but limited effect (0.3 mm)



Interconnection Cryostats

Update wrt ICC 15/02/2008

Sequence of events :

4. Last Friday (15/2), measurements of extremities of CC L8 and R7 were taken and under analysis ; it was decided to close to be able to perform leak test and, in case position is acceptable, go on with the programme for restart of cooldown
5. Monday 18/2 : Meeting with TS-SU, TS-MME, AB, MCS to review the results of Romer arm and Leica measurements wrt the acceptable tolerances
 - Some displacement wrt neighbours (Q11R7) of 1.2 mm ; not within the specification
 - Reference measurement at L8 was lost
 - Blind for the central part
 - Define a sequence to take reference measurement for the next sectors (6-7 and on...)
 - Define a sequence if it is possible to intervene in 7-8
6. Tuesday 19/2 :
 - Leak tests (air to insulation vacuum and CM to insulation vacuum with 1.1 bar) were performed, in advance by one day on schedule as residual was good
 - R7 : Leak tight / L8 : Leak on the closure of the cryostat (air to insulation vacuum 10^{-3} mb l/sec)
 - A very aggressive schedule was done to carry out the intervention in 7-8 with no or very limited impact on the schedule **(Thanks to TS, HCC, VAC, CRG, MEI, MCS, IEG ... colleagues for availability, flexibility, information, adaptability)**



Interconnection Cryostats Update wrt ICC 15/02/2008

Solution in 7-8 :

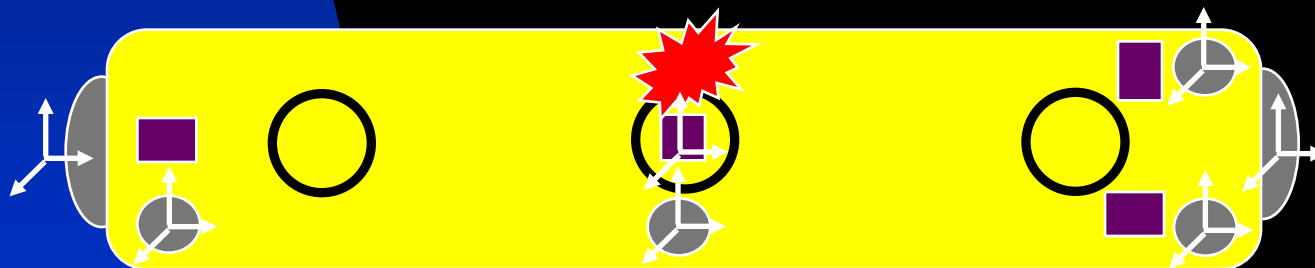
1. Reopen interconnections to allow access to CM extremities (IEG) [Done]
2. Perform a new complete in-situ fiducialisation of extremities wrt fiducials (TS-SU) [Done for R7 ; today for L8] – Already done for some dipoles when fidu was lost for corrosion
3. Realign the CC to its nominal position (TS-SU) [Done for R7 ; today for L8]
4. Check position of extremities wrt neighbours with Romer arm (TS-MME) [Today/Tomorrow morning]
5. Reclose the ICs [tomorrow]
6. Fill CM with 6 bars
7. ELQA on Friday morning
8. Leak test to be repeated



Interconnection Cryostats Update wrt ICC 15/02/2008

Solution in other sectors

1. Open interconnections to allow access to CM extremities (IEG)
2. Access the central foot to perform ref measurement (MCS)
3. Perform a reference measurement of fiducials (TS-SU)
4. Perform measurement of CM extremities wrt neighbours and also of the central foot wrt to ground (TS-MME)
5. After rewelding, Perform a new fidu and realign the CC to its nominal position (TS-SU)
6. Check position wrt neighbours and ground for the central foot (TS-MME)
- If too high deformation of the CM, use the central post to correct the shape (If required only)
7. Reclose the ICs



A further detailed presentation of the method and results obtained for the nominal procedure and for the rescue one (7-8) will be done by TS-SU to determine the accuracy



Interconnection Cryostats

Sector	Repair of ICCs	Completion date
1-2	Planned (4th)	End W11
2-3	Planned (5th)	W12
3-4	Planned (6th)	W13
4-5	Planned (7th) During consolidation	W17
5-6	Afer warm-up (8th) - 3 units ?	?
6-7	Insulation reinforcement / Ref measurements	Beginning W9 (delay)
7-8	Repositionning	End W8
8-1	Under opening	Mid W10

Delay in 6-7 : due to setting-up of measurement procedures in parallel with 7-8 and fire brigade exercise tomorrow



Sector 4-5 consolidation (update)

Starting date : 17/03/2008 (Monday W12)

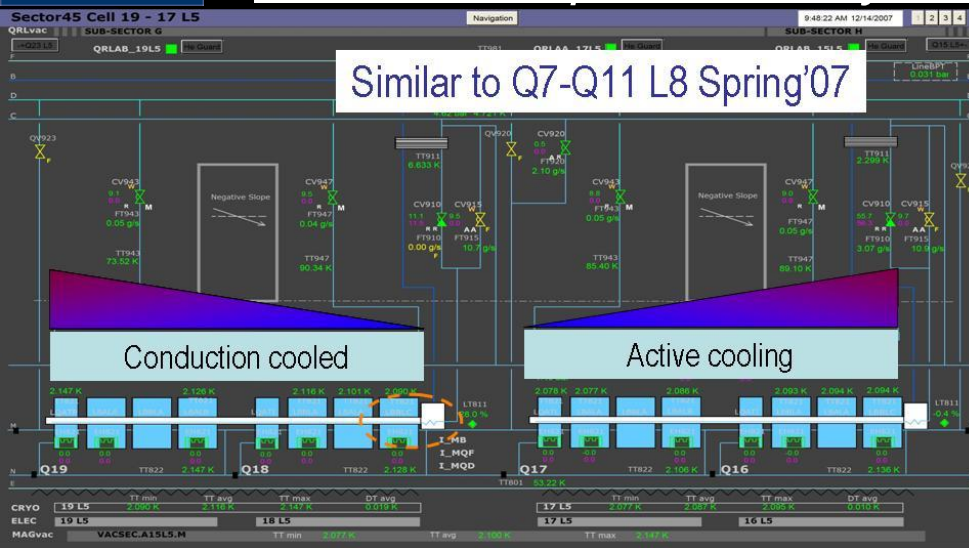
Sector 4-5 Consolidation

1	Plug-in modules	7 weeks
2	Photometer test	3 days
3	Y lines	3 weeks
4	Helium guards	2 weeks
5	Leaks	3 weeks ?
6	Triplet 5L	8 weeks
7	Q5R4	2 weeks ?
8	Connection Cryostats	5 weeks
9	CC splices	1 day
10	DFBs cables	?



Cryomagnets interconnection

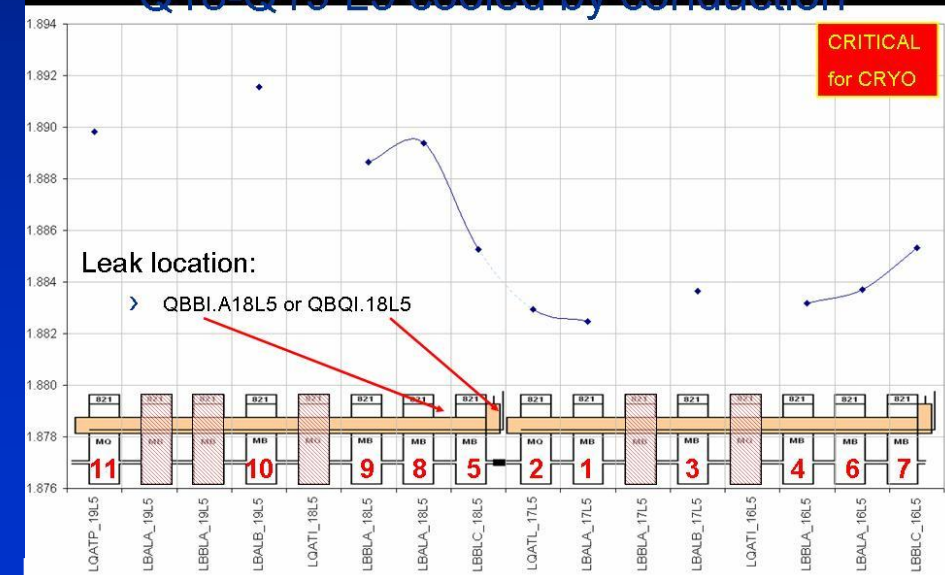
Line Y interruptions : Analysis to localise the defect (C Maglioni, V Parma)



Analysis allows to determine to 1/2 ICs where the disruption is.

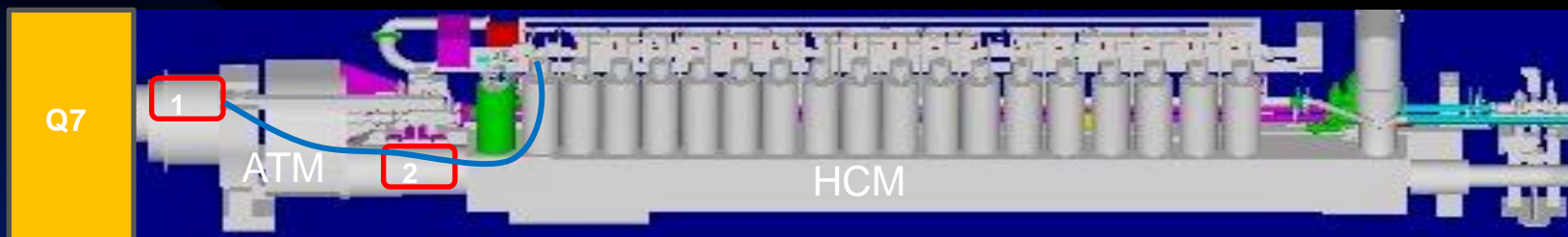
The approach for repair and inspection is defined

Q18-Q19 L5 cooled by conduction



Cryomagnets interconnection

Intervention on DFB cables ? (M Felip, A Perin)



DFBA	Position
DFBAH	4R
DFBAI	5L
DFBAO	8L
DFBAA	1L
DFBAP	8R

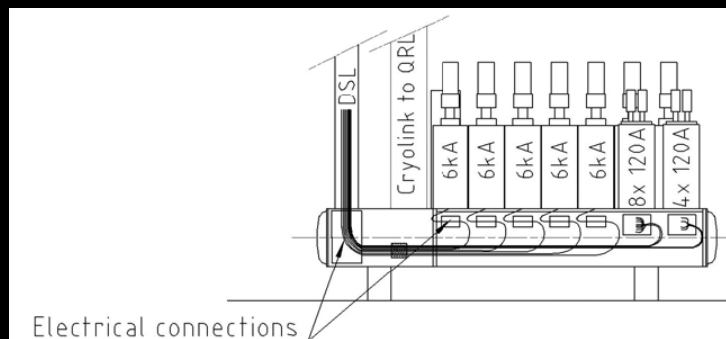
DFBL	Position
DFBLD	5L
DFBLA	1R
DFBLB	1L

1. Decision on necessity to repair ? To be taken in the coming days

2. For DFBA, both extremities are accessible ; can be managed (MCS, TS-MME) ; can be in the shadow of triplet reconnection

3. For DFBL: Availability of water cooled cables can prevent us from doing the intervention

4. For DFBLM (8L&2L), WCC ?





Quick IC overview

	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-1
Q1Q1: 1								
Q1Q1: 2								
Q1Q1: 3								
Q1Q1: 4								
Q1Q1: 5								
Q1Q1: 6								
Q1Q1: 7								
Q1Q1: 8								
Q1Q1: 9								
Q1Q1: 10								
Q1Q1: 11								
Q1Q1: 12								
Q1Q1: 13								
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Q1Q1: 47								
Q1Q1: 48								
Q1Q1: 49								
Q1Q1: 50								

Sector	On-going	Planned
1-2	2 IC opened ; Jack problem (Status)	Leak test, closure of lcs, Repair of ICCs
2-3	1 IC opened for leak repair QBQI.23L3.(nc 892781)	Leak repair (W9) / Repair of ICCs
3-4	NA	ELQA - Purge and flushing, Repair of ICCs
4-5	Q1/Q2/Q3 IC / Warm-up	Consolidation from W12
5-6	Cold	Cooldown
6-7	Repair of ICCs	Cooldown
7-8	Repair of ICCs up to end of W8	Restart cool down
8-1	Cold stand-by / Repair of ICCs	Restart cool down

19 ICs to close:

- 15 in the arc
 - 12 for CC, 1 for LT, 2 for jack
- 4 in L5 triplet
 - Q1/Q2 closed
 - Q2/Q3 under closure

Status in 1-2 ?

- * Repair ? : Meeting on site between TS-MME and CE
- * Inspection launched by TS-ICC
- * Not (yet) critical
- * Inspection by surveyors of all SSSs?

	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-1
Q1Q1: 19								
Q1Q1: 20								
Q1Q1: 21								
Q1Q1: 22								
Q1Q1: 23								
Q1Q1: 24								
Q1Q1: 25								
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