

LHC Arc and Special Interconnections: update

F. Bertinelli / AT-MCS

(on behalf of IC Team)

- Overview by sector
- Status of helium gauges (with V. Parma and N. Bourcey)

Sectors Overview

Sector	Status	Next activities
1-2	<ul style="list-style-type: none"> • 12 He-Gauges already repaired; • All VACSECs are provided to VAC and under pumping (last IC closed Monday 3 December after Helium Guard repair) – 14/14 VACSECs leak-tightness without repairs (a first !); • Triplets 1R&2L: closed. 	<ul style="list-style-type: none"> • Pressure test end of W49 (last one); • Plan for consolidation after pressure test: <ul style="list-style-type: none"> - PIM to be exchanged in triplet Q2/Q3 R1 (NC 882743, VACSEAL varnish) - finish He-Gauges repairs.
2-3	<ul style="list-style-type: none"> • 6 He-Gauges under repair (bent tubes); • Leaks localised and under repair: <ul style="list-style-type: none"> - QBBI.10L3, M1 (material leak): repair ongoing by AT-MCS; - QQBI.9L3 : K-C' circuit, F collector (material leak): repair ongoing by VAC. 	<ul style="list-style-type: none"> • Flushing W51; • Plan for consolidation <u>after</u> flushing: <ul style="list-style-type: none"> - finish He-Gauges repairs.

Sectors Overview

Sector	Status	Next activities
3-4	<ul style="list-style-type: none"> • DSLC and DFB IC completed (4 December, 2007): insulation vacuum under leak test. Special Thanks to F. Laurent and I. Slits (ending contract). • Leak repair internal line jumper DF BAG in L4: <ul style="list-style-type: none"> - Jumper closed (4 December); - QBQI.12L4: reweld E line ongoing, close IC 	<ul style="list-style-type: none"> • Repair He-Gauges <u>before</u> flushing • Flushing W51 (with possible small delay)
4-5	<ul style="list-style-type: none"> • Cool down to 1.9K in progress • Current plan for delayed warm-up (by ~ 6 weeks) involves start of reconnection triplet 5L in W11/2008: 6+2 weeks work extending beyond the present F523 IEG contract end (30/4/2008) ! 	<ul style="list-style-type: none"> • ELQA - Power test • Inspection He-Gauges
5-6	<ul style="list-style-type: none"> • Cool-Down re-started after diode repair 	<ul style="list-style-type: none"> • Cool-down • Inspection He-Gauges
6-7	<ul style="list-style-type: none"> • Flushing (with continuous ELQA monitoring) 	<ul style="list-style-type: none"> • Cool-down • Inspection He-Gauges

DSLCL-DFBA IC completed

AT-MCS



DSLCL-DFBA R3



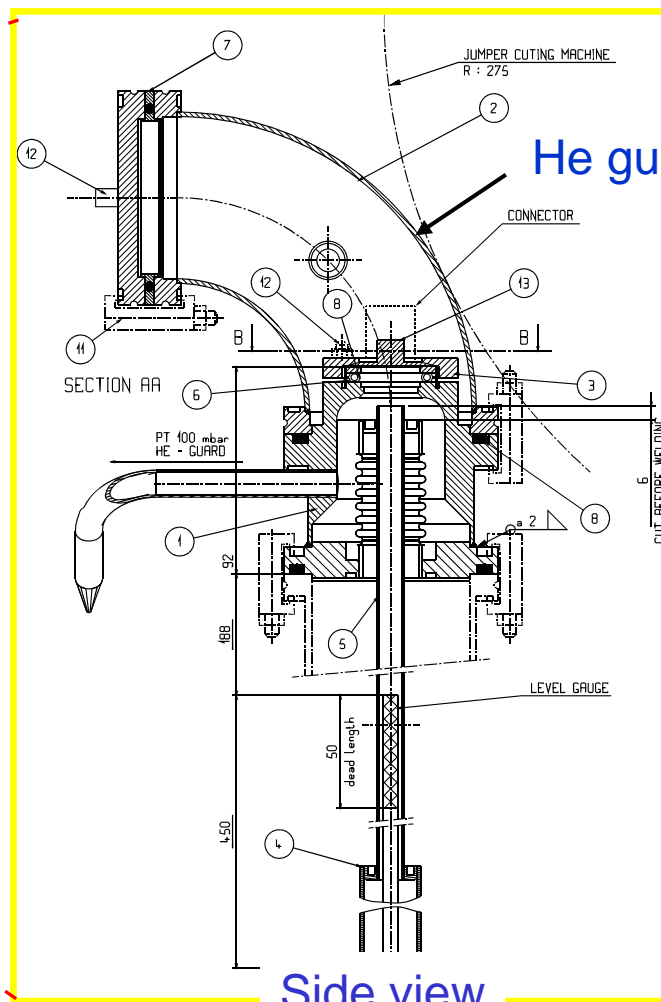
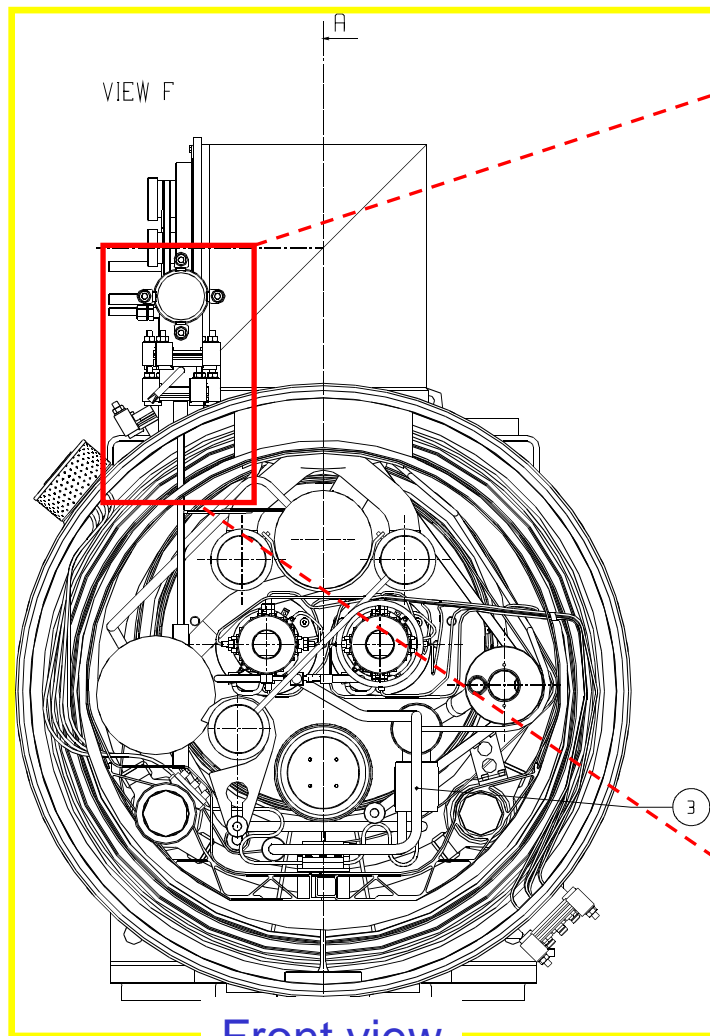
4 December, 2007: last DSLCL-DFBA special IC

Photos from M. Struik

Sectors Overview

Sector	Status	Next activities
7-8	<ul style="list-style-type: none"> • Q9R7, K-C' circuit, metal hose in jumper, QRL side: <ul style="list-style-type: none"> - Repair described last ICC; - Test in lab: no leak visible under internal vacuum or pressure, but leak visible under internal pressure and outer vacuum (E-3); - E-8 residual in tunnel after repair. • He-Gauges under repair; • D1/DFBX 8L, M1 bellows: ongoing repair, ending W49. 	<ul style="list-style-type: none"> • Cool-down.
8-1	<ul style="list-style-type: none"> • “Mini-pressure test” W49 	<ul style="list-style-type: none"> • Repair 1 He-Gauge before cooldown; • cool-down.

Helium level gauge feed-through on SSS



from V. Parma

Helium gauge bellows

- Direct inspection of bellows damage by endoscopy (with TS-MME) started W47:
 - 1-2, 2-3, 3-4, 7-8, 8-1 fully inspected (tube angle measurement and endoscopy);
 - results from both methods mostly (but not always) correlated;
 - 4-5 and 6-7: angle measurement W49
- Procurement replacement bellows:
 - 8 from VACOM, in stock
 - 50 from SKODOCK, 6 weeks delivery time
- Enquiries with IEG (meeting 29 November):
 - Known interference translating US welding block from M2 to M1 spools, “a few mm”, not systematic (typically 1 in 4 QBQI with jumpers, but 1 in 2 for sector 1-2);
 - Operators trained to release clamps and translate, not rotate: sensitive to fragility of inner component;
 - IEG QC Inspector audits checked this;
 - IEG found several cases of released clamps before their initial inspection.



Helium gauge bellows status

AT-MCS

	Damaged	Bellows needing replacement	Already done
1-2	24/27	24	12
2-3	15/27	9	ongoing
3-4	3/27	3	-
4-5	Ongoing visual inspection		
5-6			
6-7	Ongoing visual inspection		
7-8	12/26	7	7
8-1	6/27	1	-

from N. Bourcey

Helium gauge bellows

- Work traceability used to investigate operator, US machine number, US weld date:
 - IEG US staff is stable in time, no apparent explanations there;
 - I believe we are still missing another non-IEG effect.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	SECTEUR 1-2															
2	SECTEUR 1-2															
3	SECTEUR 1-2															
4	SECTEUR 1-2															
5	DATE DE MISE A JOUR				30/11/2007											
6	INSPECTION JAUGES HELIUM									M1			M2			
7	SECTEUR	IC	SSS	Angle	Inspection	Photos	Action		mc	operateur	date		mc	operateur	date	
8	1-2	QBQI.7R1	625	5°	OK suite endoscopie le 23/11/2007.					CERN				Boyer/Lheritier	11/06/2007	
9	1-2	QBQI.9R1	677	-5°	OK suite endoscopie le 23/11/2007.			4	Boyer/Lheritier	14/06/2007		4	Boyer/Lheritier	14/06/2007		
10	1-2	QBQI.11R1	521	15°	OK suite endoscopie le 23/11/2007.					CERN			4	Boyer	07/08/2007	
11	1-2	QBQI.13R1	340	60°	A remplacer.		Fait le 20.11.2007			CERN				Bibent/Majdoub	01/06/2007	
12	1-2	QBQI.15R1	352	35°	A remplacer.		Fait le 20.11.2007	4	Boyer/Majdoub	10/05/2007		4	Boyer/Majdoub	10/05/2007		
13	1-2	QBQI.17R1	342	5°	A remplacer suite endoscopie le 23/11/2007.	Link		6	Boyer/Bebendo/Lheritier	31/05/2007		6	Boyer/Bebendo/Lheritier	31/05/2007		
14	1-2	QBQI.19R1	353	30°	A remplacer suite endoscopie le 23/11/2007.	Link		6	Boyer/Lheritier	25/06/2007		6	Boyer/Lheritier	25/06/2007		
15	1-2	QBQI.21R1	47	0°	A remplacer suite endoscopie le 23/11/2007.	Link		6	Boyer/Bebendo/Lheritier	31/05/2007		6	Boyer/Bebendo/Lheritier	31/05/2007		
16	1-2	QBQI.23R1	359	25°	FUITE. A remplacer.		Fait le 13.11.2007	6	Boyer/Bebendo/Lheritier	31/05/2007		6	Boyer/Bebendo/Lheritier	31/05/2007		

Helium gauge bellows

- QBQI.19R2 : ongoing AT-MCS test to repeat mounting US machine
- 1-2: endoscopy will be repeated after pressure test
- Tooling in fabrication to allow 2nd repair technique:
 - no need to open W bellows,
 - no butt weld,
 - still need to break insulation vacuum,
 - but more difficult operations in-situ.
- Repair work continues, in shadow of other activities:
 - ICIT visual weld inspection,
 - inner tube endoscopy (cases of lack of fusion found),
 - leak tightness with clamp shells,
 - closing IC.
- FRAGILE panels being prepared.