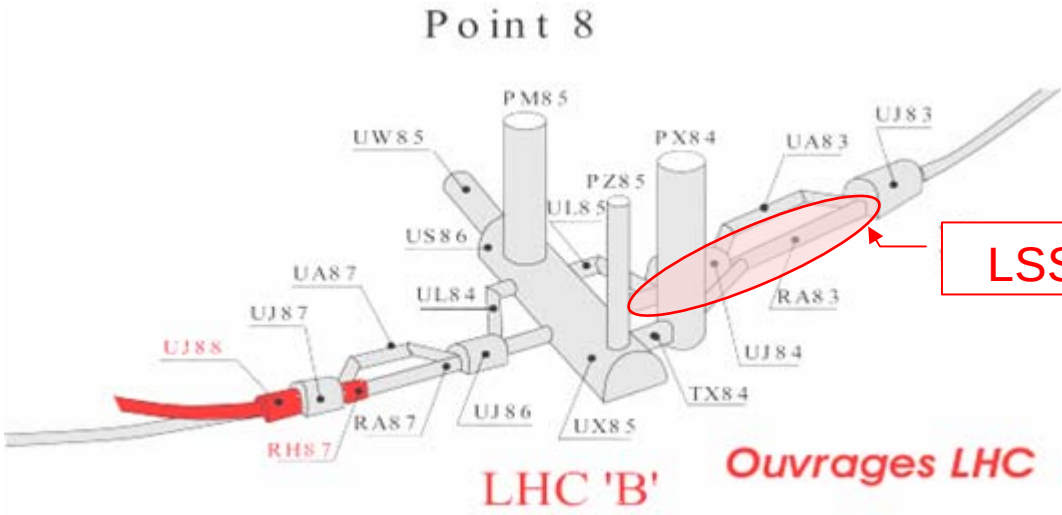
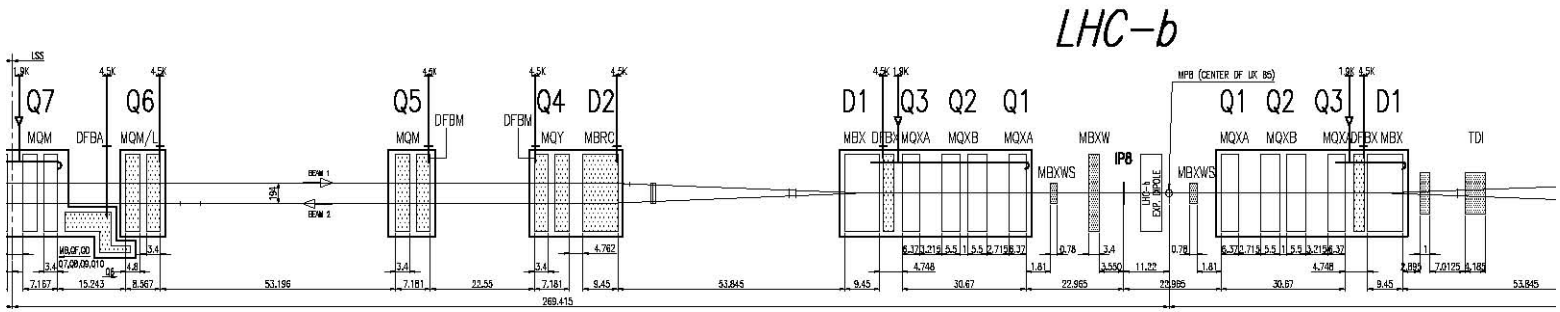
Installation Readiness of LSS in IR8

1. Magnet availability
2. Cold vacuum system
3. Cold powering
4. Interconnections
5. Infrastructure
6. Conclusions

R. Ostojic, TCC 3 June 2005

LSS8 situation





Schedule

IR8L:			
Element	Installation date	SMI2	MEB
Q1-Q2-Q3	18.08.05	1.07.05	1.06.05
DFBX, D1	07.10.05	1.09.05	D1 (OK)
D2-Q4			D2 (OK)
Q5,Q6	10.10.05	1.09.05	1.08.05
DFBM			
Interconnect	10.10.05		
Q7-Q11	01.02.06		
IR8R:			
Q1-Q2-Q3	19.08.05	1.07.05	1.06.05
DFBX, D1	05.12.05	15.10.05	D1 (OK)
D2-Q4			D2 (OK)
Q5,Q6	12.12.05	15.10.05	1.09.05
DFBM			
Interconnect	12.12.05>		
Q7-Q11	01.02.06	15.12.05	1.11.05

Available magnets

Delivered and accepted magnets at CERN:

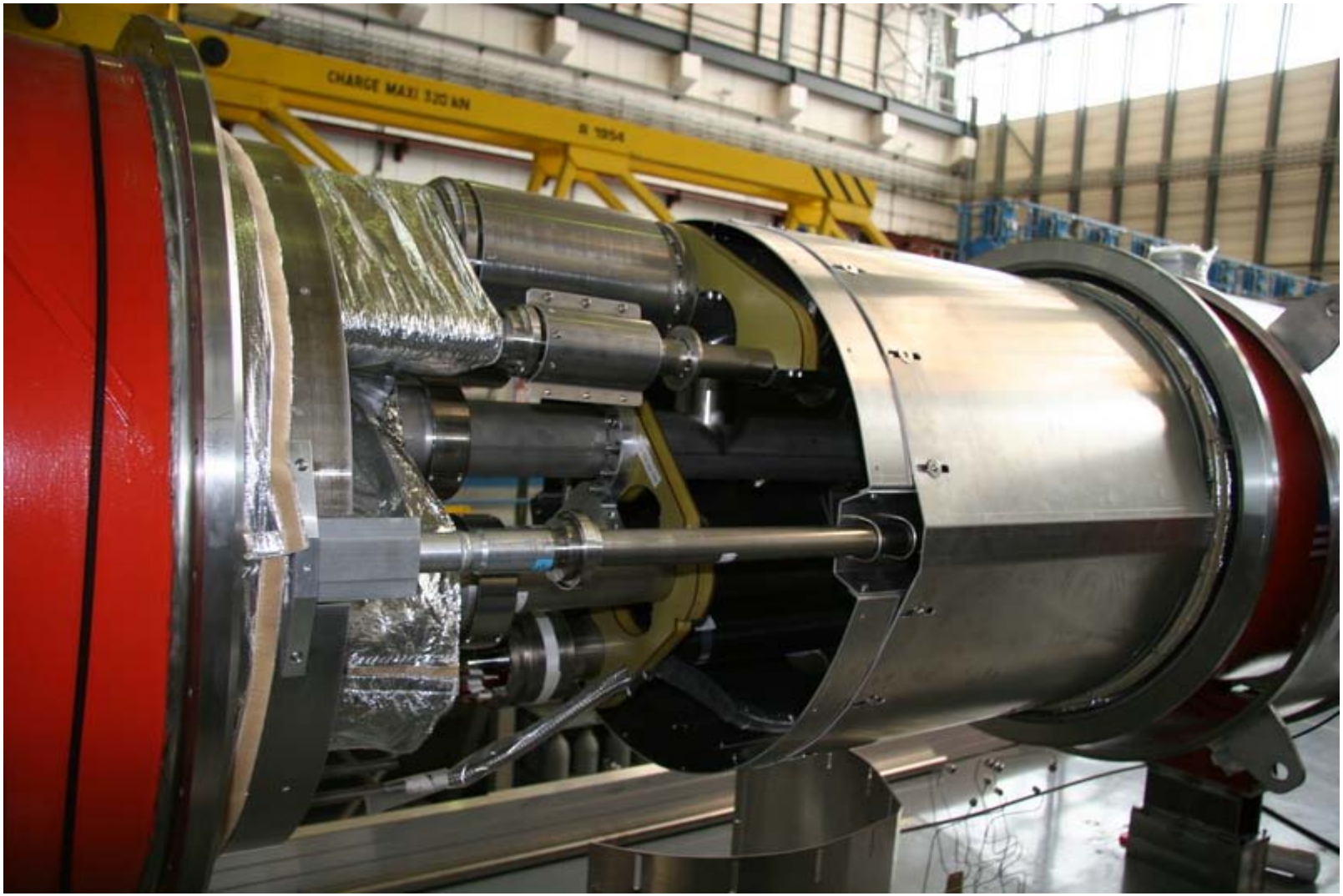
- 5/5 D1
- 8/9 D2
- 1/3 D4
- 1/3 D3
- 4/9 Q1
- 3/9 Q2
- 1/9 Q3 (damage in transport). Q3-02 to arrive in June 05.

Low-beta triplet assembly in Bld. 181

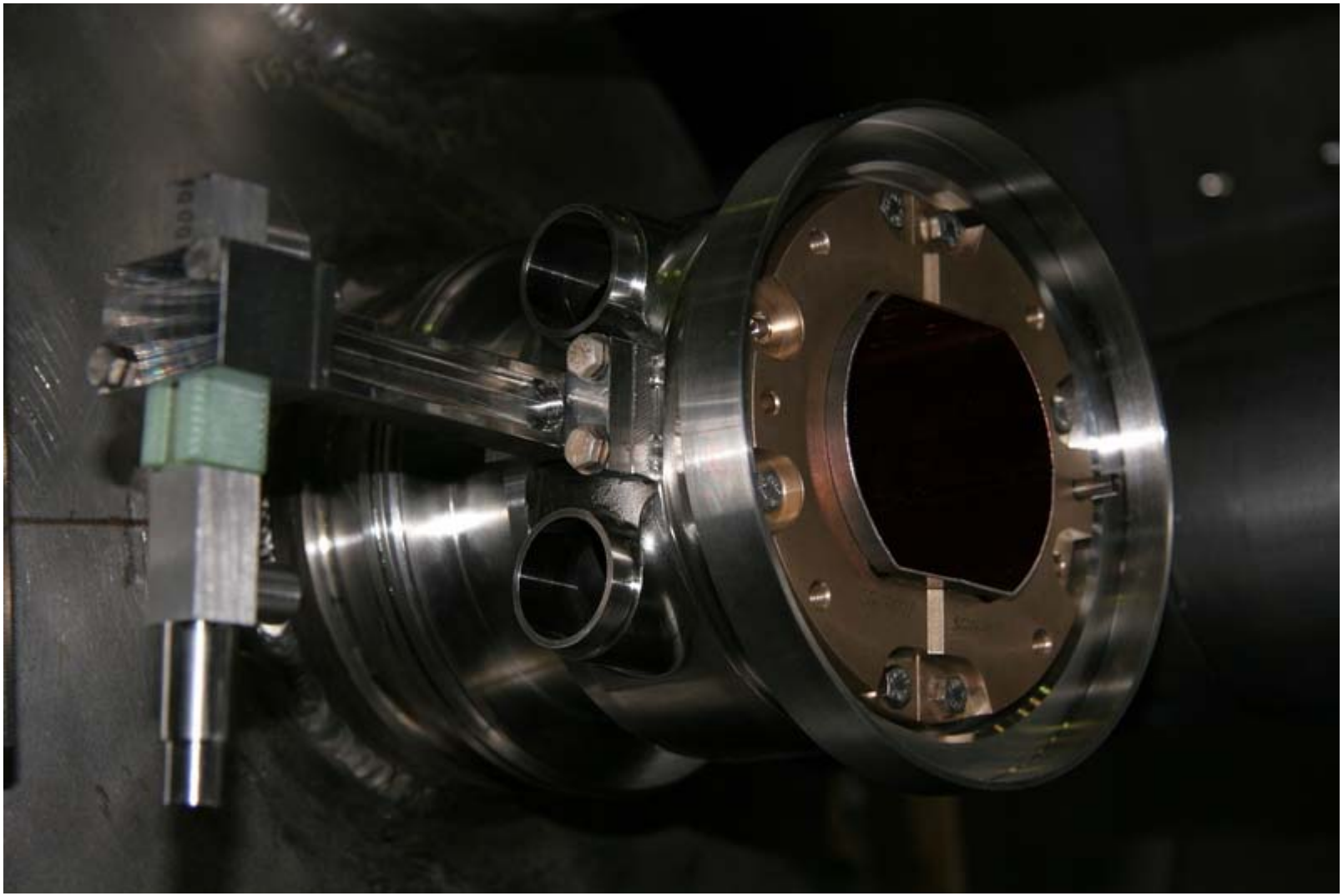
- Check availability of components and tooling.
- Assemble interconnects, check tooling and procedures.
- Perform instrumentation and continuity checks for the string from DFBX
- Mount and check alignment equipment.
- Check string behaviour under insulation vacuum.
- Check handling equipment.

Q1 - Q2 interconnect

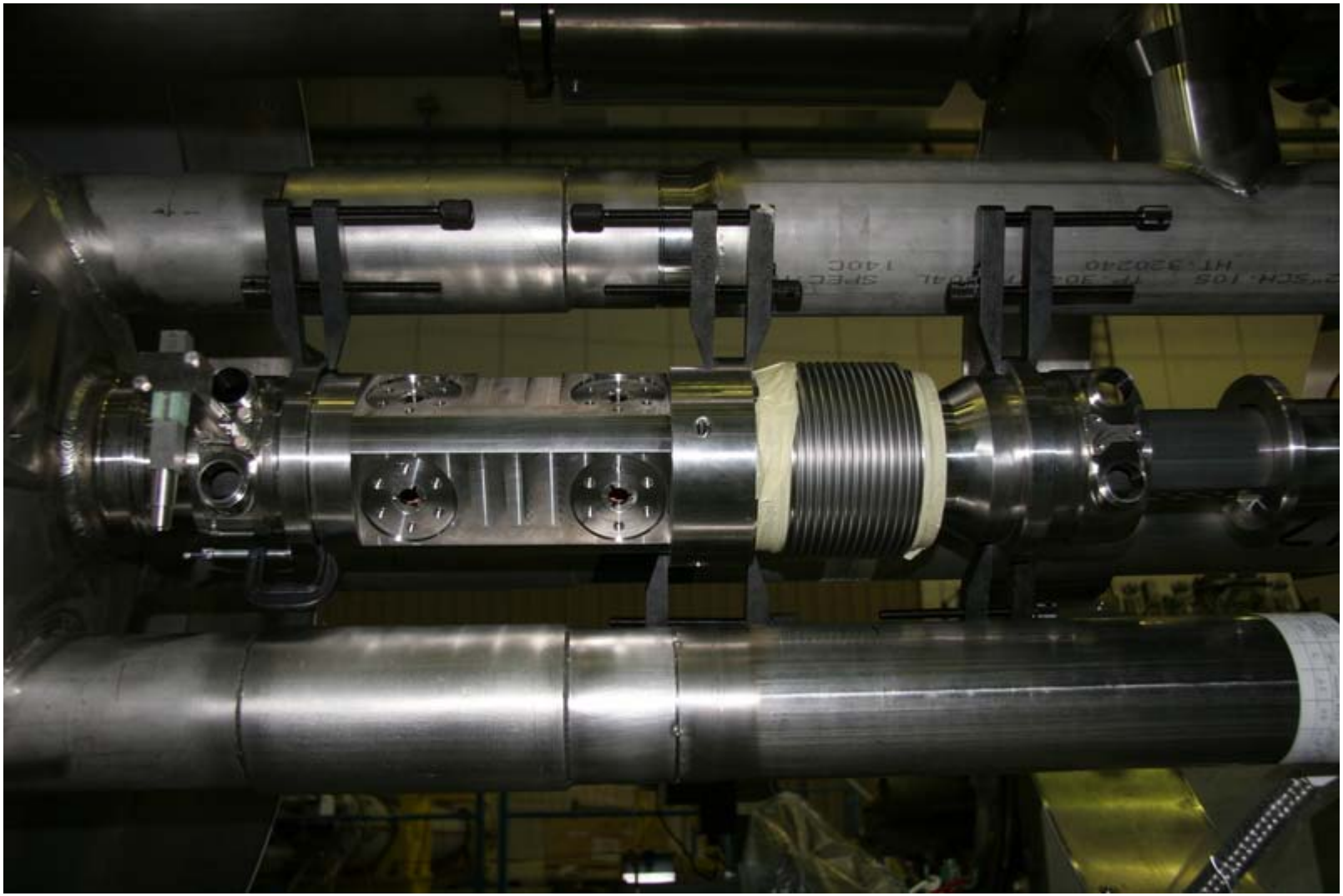
Q1 - Q2 interconnect



Beam screen - fixed point

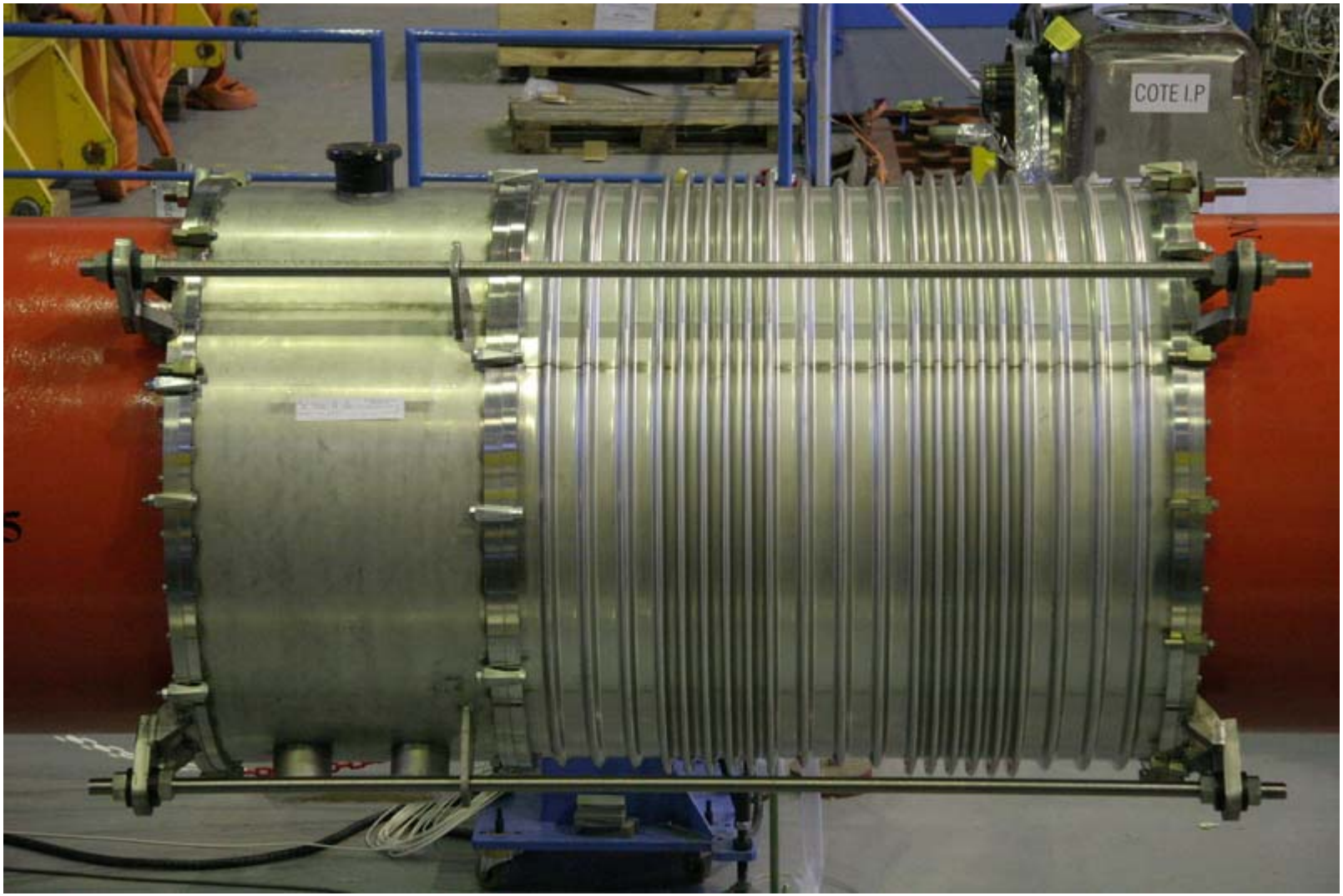


Q2 - BPMS

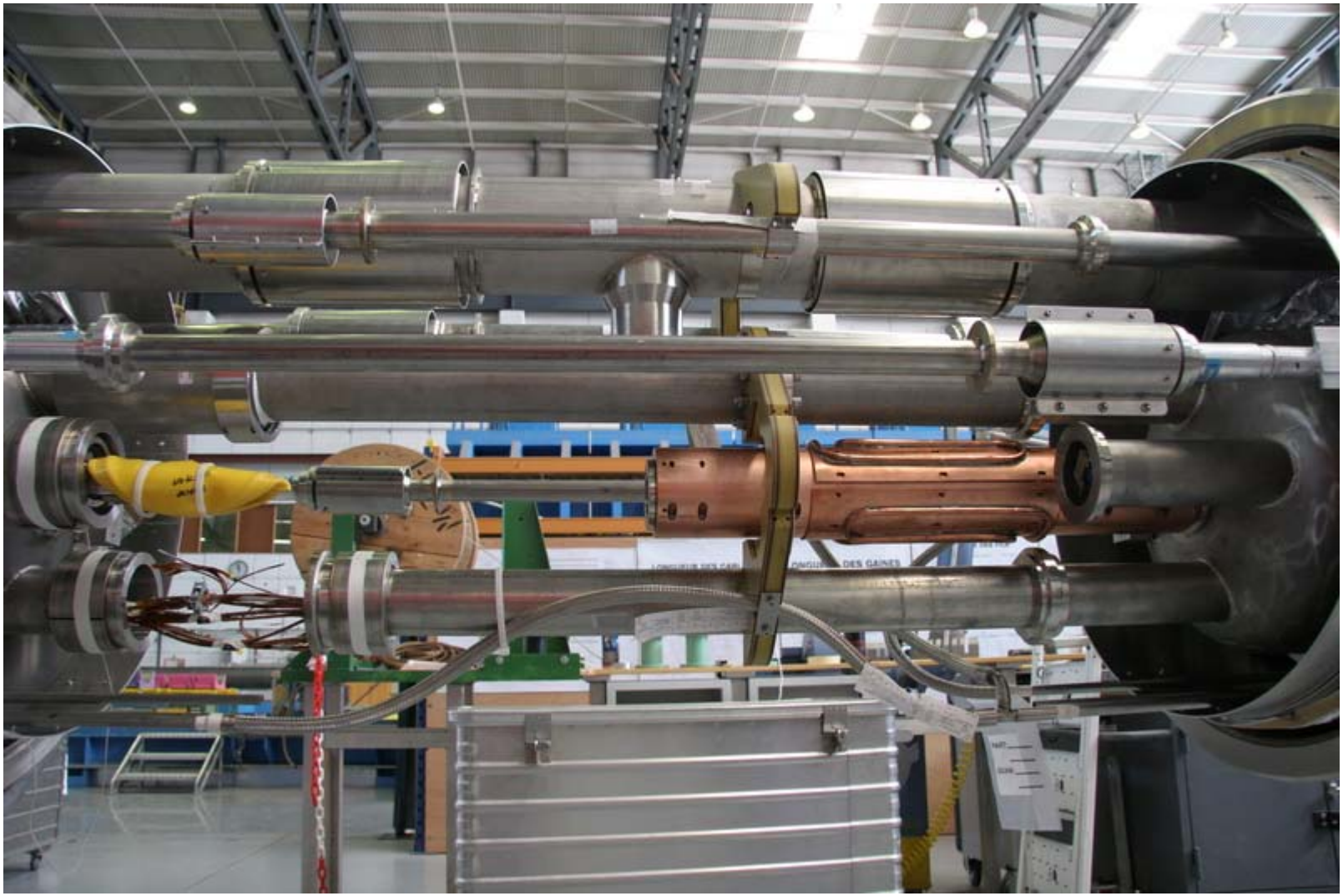


Q2 - Plug-in module

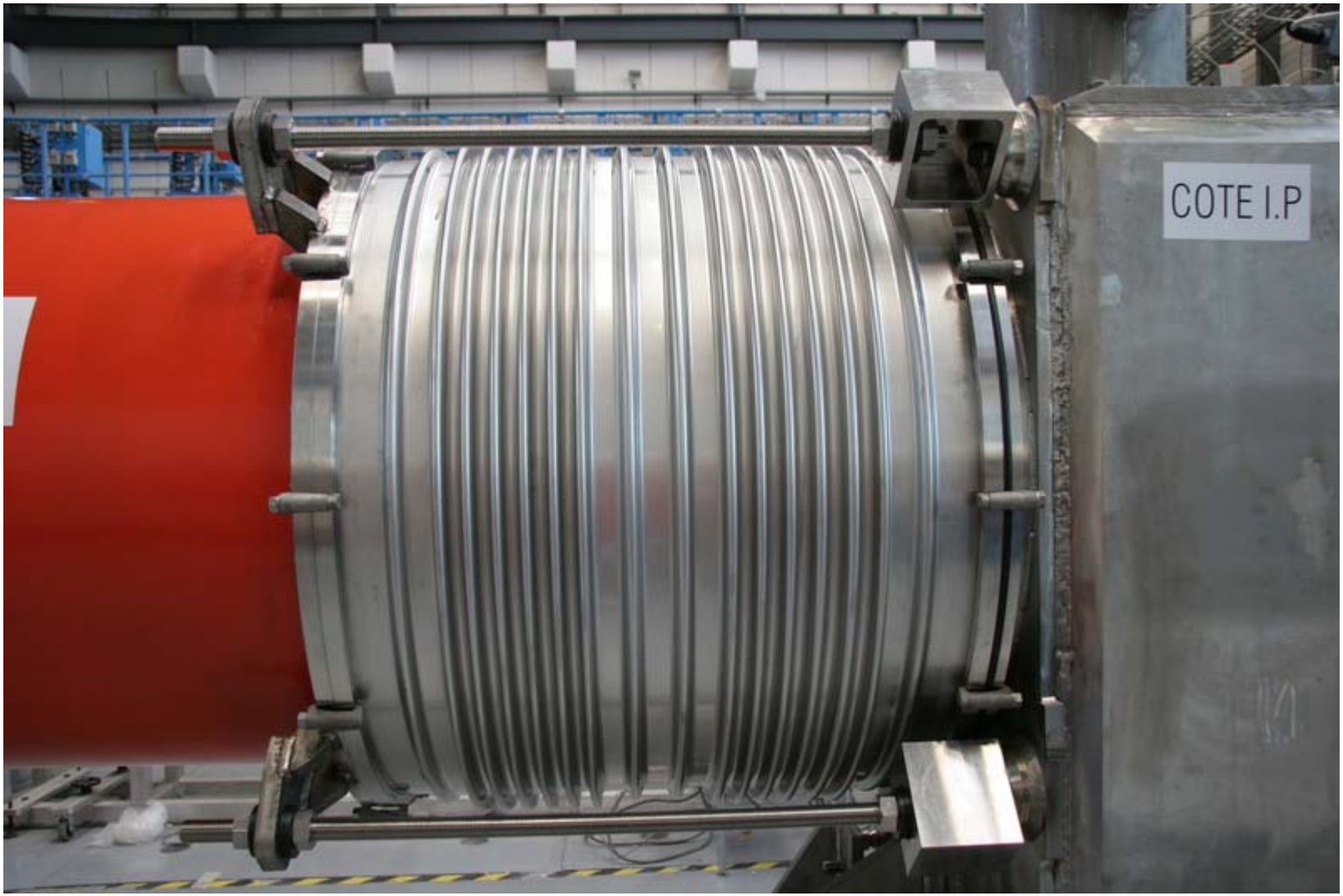
Q1 - Q2 interconnect closure



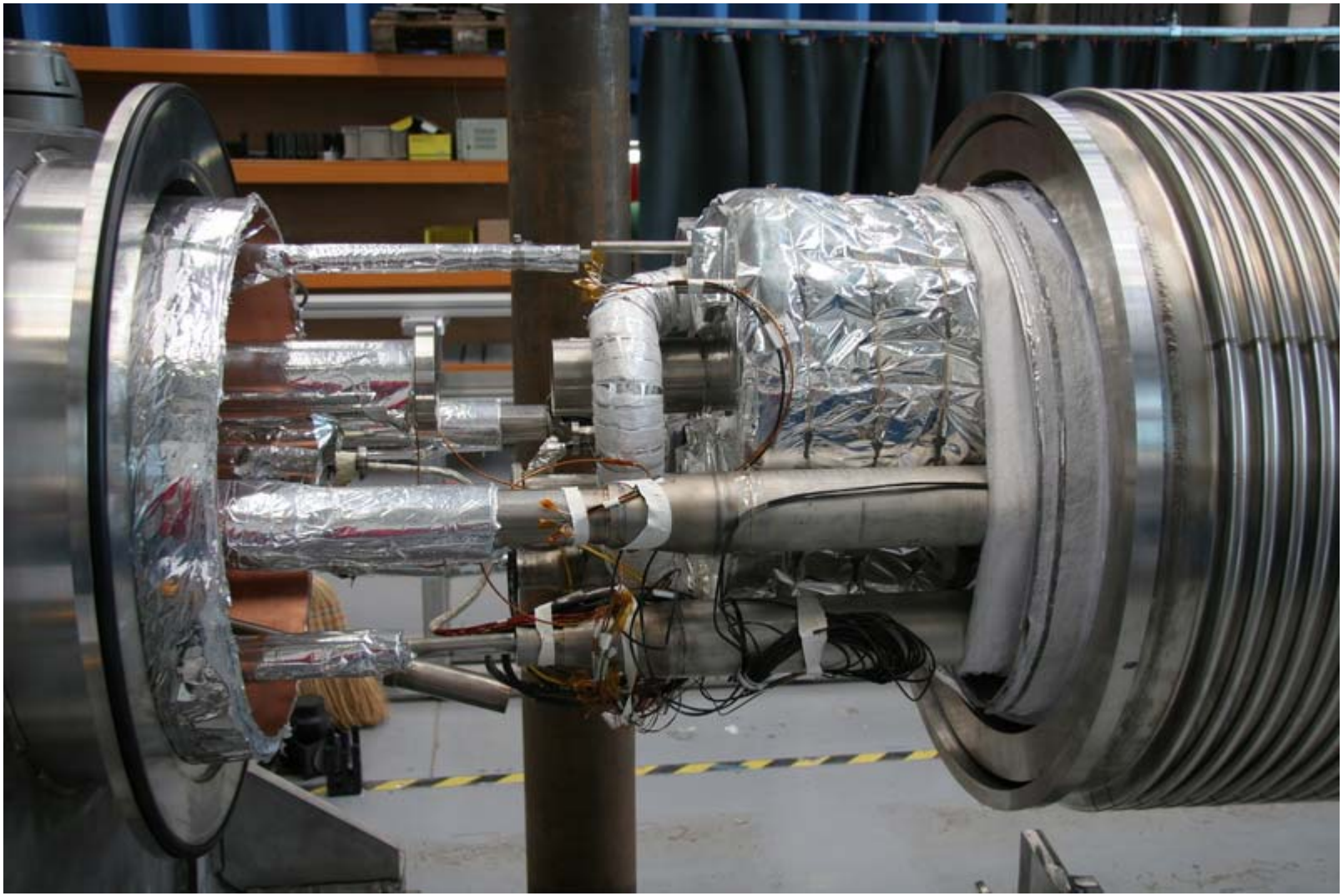
Q2 - Q3 interconnects – TAS B



Q3 - DFBX



DFBX - D1



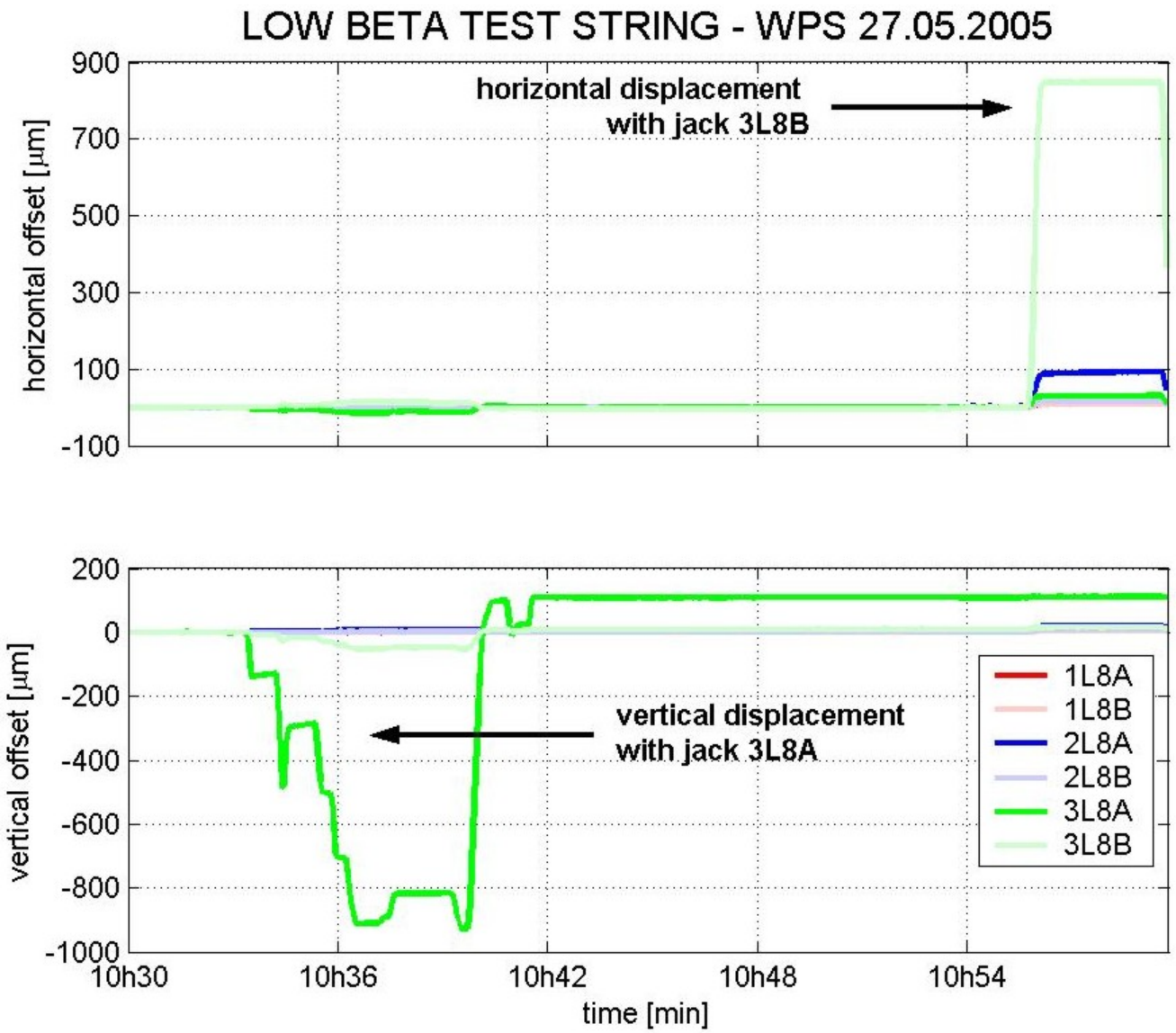
DFBX - D1 closed

D1 – non-IP end

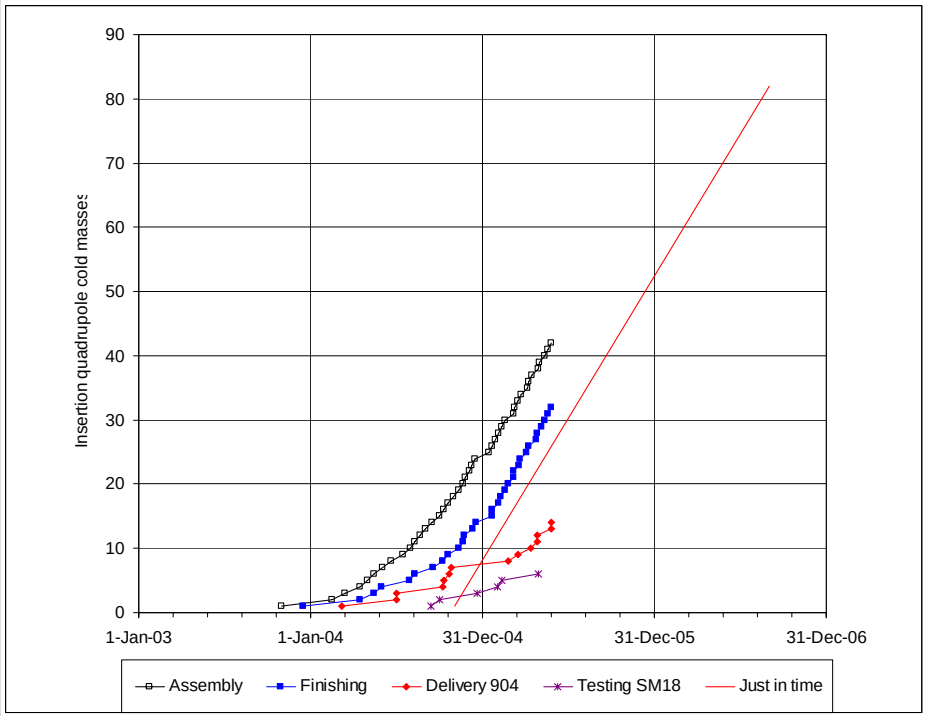
Low-beta triplet in 181

Triplet assembly highlights

- Interconnections between quadrupoles and Q3-DFBX:
  - FNAL done a very good job of the design and delivery of all components and tooling under their responsibility.
  - Some tools have to be improved (e.g. tools for compressing bellows), and components modified (e.g. flanges, fixing holes in thermal shields).
  - CY' missing! (25 mm copper tube has to be pulled through from Q3 to Q1 before installation of the DFBX).
  - Interference between BPMS signal cables and Q2 thermal shield. Redesign necessary.
- Interconnections between DFBX-D1
  - Several components were not delivered by BNL or need to be modified.
- General
  - Polarity of magnets confirmed in the string.
  - Instrumentation and continuity from DFBX confirmed.
  - Alignment of magnets under vacuum confirmed.
  - Limited rigidity of the jacks and their supports.


LOW BETA TEST STRING - WPS 27.05.2005
horizontal displacement with jack 3L8B
horizontal offset [μm]
900
700
500
300
100
-100
vertical displacement with jack 3L8A
vertical offset [μm]
200
0
-200
-400
-600
-800
-1000
1L8A
1L8B
2L8A
2L8B
3L8A
3L8B
10h30
10h36
10h42
10h48
10h54
time [min]

Insertion quadrupoles: production



	Left							Right						
	Q10	Q9	Q8	Q7	Q6	Q5	Q4	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1	LMQMD615	LMQMH616	LMQMD617	*LMQMF690*	*LMQMM619*	*LMQMN620*	*LMQYC621*							
2														
3														
4		*LMQMI630*	*LMQMC631*						*LMQYH635*	*LMQYB636*		LMQMD638	*LMQMH642*	LMQMD641
5	LMQMD640	LMQMH603	LMQMD643											
6														
7														
8	LMQMD601	LMQMH639	LMQMD602	*LMQMF604*	*LMQMJ605*	*LMQML606*	*LMQYJ607*	*LMQYI608*	*LMQYE609*	*LMQMJ610*	*LMQME611*	LMQMD612	LMQMH613	LMQMD614

Insertion Quadrupoles: cryostating and testing

- To date only DS type quadrupoles cryostated and tested
- Cryostating:
  - Components for Q4L8 available beginning June 05.
  - Assembly rate of 4 quadrupoles per month (one MS and 3 DS) as from mid-July 05.
- Testing:
  - From beginning 2005 priority given to arc-SSS. As from June 05, one bench devoted full time for insertion quadrupoles.
  - Five insertion quadrupoles (DS type) in backlog.
  - Test rate (1 week per magnet; 2 weeks per magnet for Q4 and other first of the kind magnets).

It is expected that Q4L8 may be available for installation on 1 October 05. Q5L8 and Q6L8 will follow in intervals of one month.

Cold vacuum: beam screen and CWT assembly

- Components expected for 15 July 05.
- No manpower allocated; no space allocated.
- First of the kind activity.

It is estimated that it may be possible to complete 2-3 magnets by 15 August 05.

Resistive magnets

- MBWXS and MBXWH magnets available
  - Vacuum chamber to be installed
- Survey markings to be done
- Support and transport tools to be designed

It is estimated that the resistive magnets can be ready for installation by 15 August 05.

Summary of magnet availability

IR8L:		
Element	Installation date	Critical activity
MBXWS,H	18.08.05	
Q1-Q2-Q3	18.08.05	SMI2
DFBX-D1	07.10.05	
D2-Q4		Q4 completion (904-SM18)
Q5,Q6	10.10.05	→ Dec. 05 (904)
IR8R:		
MBXWS	19.08.05	
Q1-Q2-Q3	19.08.05	→ Oct. 05 (SMI2)
D1	05.12.05	
D2-Q4		
Q5,Q6	12.12.05	

Interconnections

- Interconnect team available (combined for arcs and LSS).
  - The team was not available for the inner triplet assembly in 181 in March 2005. A second assembly campaign for training under consideration.
- Components for Q1-Q3 available, for D2-Q4 interconnect in production.

Interconnections of low-beta triplet starting in October feasible.

Cold powering: DFBM

- The first DFBM for D2-Q4 available at best end of October.

Cold powering: DFBXG

- Two DFBX feedboxes delivered in Feb 05.
- Acceptance tests (electrical, leak tests, alignment) performed.
- Repair of instrumentation on DFBXG current leads completed.
- Modification and check of interfaces to D1 to be done.
- Installation of signal distribution boxes end of June 05.
- Design and fabrication of gas recovery manifold and superstructure by Sep 05.
- Next two DFBX expected end of June.

Infrastructure

- Handling and transport:
  - One spreader beam for magnets and one for DFBX available.
  - Transfer tables for low-beta quads in production (expected Aug 05).
  - Transport wheels for DFBX in design (expected July 05).
  - Transport route for D2, Q4, Q5 and Q6 through PX24 (to be confirmed).
- Low-beta triplet placement:
  - Survey markings to be done.
  - Jack support plates to be ordered (expected August 05).
  - Standard jacks available. Motorization under test, to be installed later.
  - Alignment equipment available for one triplet; remaining equipment to be ordered in June 05.
- Shielding around IR8 to be ordered (expected in Sep/Oct. 05).

Summary of critical activities

Critical activities and items:

- SMI2 (for equipment scheduled in August and Oct 05).
- Cryostating (904) and testing (SM18) (for Q4 scheduled in Oct 05.)
- DFBM (for Q4-D2 string in October 05)
- Elements of infrastructure (for Q1-Q3 installation in Aug 05)

A large number of activities and items are on the critical path.

There is a risk that installation of LSS in IR8 will be delayed due to high-tech but also due to low-tech items (should have been resolved earlier).

Hardware commissioning of subsector Q1-Q2-Q3-DFBX-D1 possible by end of 2005; not realistic for Q4-D2.