

Status of Sector 3-4 Repair

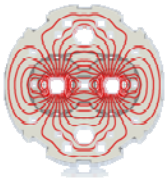
Francesco Bertinelli - TE/MSC
(15 minutes)

On behalf of - and with several contributions from - surface and IC teams

A very general overview since Chamonix (3 February, W06):

- surface activities, SM18 cold testing
- tunnel activities

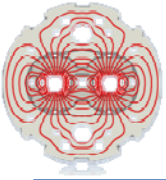
[Separate presentations: consolidations (QPS, DN200, jacks)]



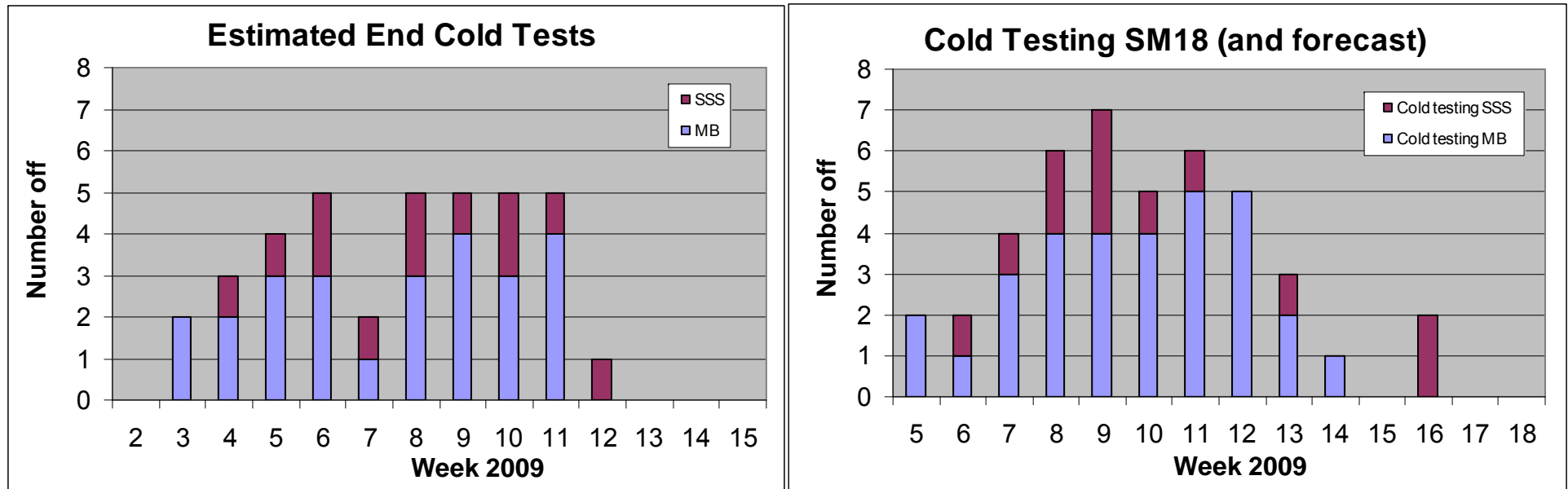
Surface News Week 14/2009

	End activity week 11 - 2009		End activity week 12 - 2009	
	Magnets	Quantity	Magnets	Quantity
Cryostating	SSS219-(2445=spare)	2	2524=spare	1
Cold testing	1092-1099-2108-2192-2433-SSS208	6	1071-2035-(2437-2438-2442=spares)	5
Stripping	2103-2428-2441-2443-2446-2690-3118	7	1071-1092-1099-2108-2192-SSS225-SSS227-SSS364	8
Fiducialization	1085-2428-2441-2446-2690-3118	6	1092-2103-2443-SSS225-SSS227-SSS364	6
Beam screen integration	1085-2427-2444-3118-SSS203-SSS221	6	2103-2428-2441-2446-2690-SSS195	6
Tunnel preparation	2252-2429-2418-2435-SSS221-SSS369	6	1085-2427-2428-2444-2690-3118	6
Installation (=pose)	2252-2418-2429-2435-2440-SSS221-SSS369	7	1085-2427-2428-2444-2690-3118	6
	End activity week 13 - 2009		End activity week 14 - 2009	
	Magnets	Quantity	Magnets	Quantity
Cryostating		0		0
Cold testing	SSS219-(2431-2445=spares)	3	3383	1
Stripping	2035-2433-2437-2438-SSS208-SSS218	6		0
Fiducialization	1092-2108-2433-2438-SSS208	5	1071-1099-2035-2437-SSS219	5
Beam screen integration	1092-2108-2192-SSS225-SSS364	5	2035-2433-2438-2443-SSS208-SSS227	6
Tunnel preparation	2441-2103-SSS195-SSS203-SSS225-SSS364	6	1092-2108-2192-2443-SSS208-SSS227	6
Installation (=pose)	2103-SSS195-SSS203-SSS225-SSS364	5	2108-2192-2441-2443-SSS208-SSS227	6

Courtesy A. Russo, M. Modena, R. Bihery

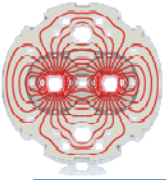


Cold testing SM18



- Increased capacity 18 kW plant W07 and operating teams;
- Improvements in splice resistance measurements, including “4th splice”;
- some delay from cryostating;
- some delay from NCR: MB2420 (29 nΩ splice resistance), MB2868 (electrical), MB2690 MB2427 MB3383 (retesting for splice resistance), SSS344 (replaces SSS006), SSS364 (replaces SSS192).

Courtesy M. Bajko



Cases with high splice resistance

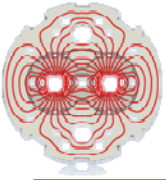


- MB2420 - 29 n Ω : opened, inter-aperture splice poor bonding

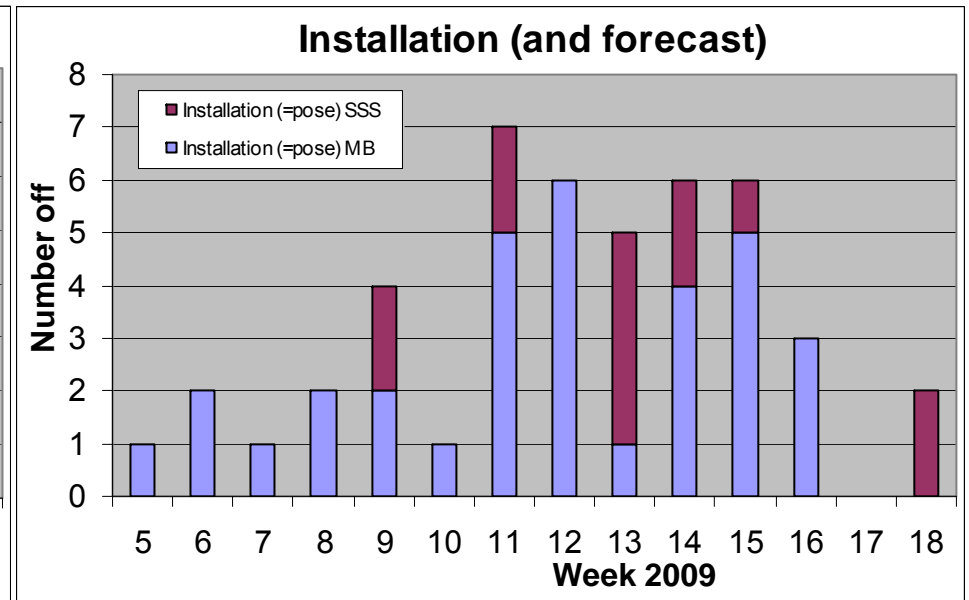
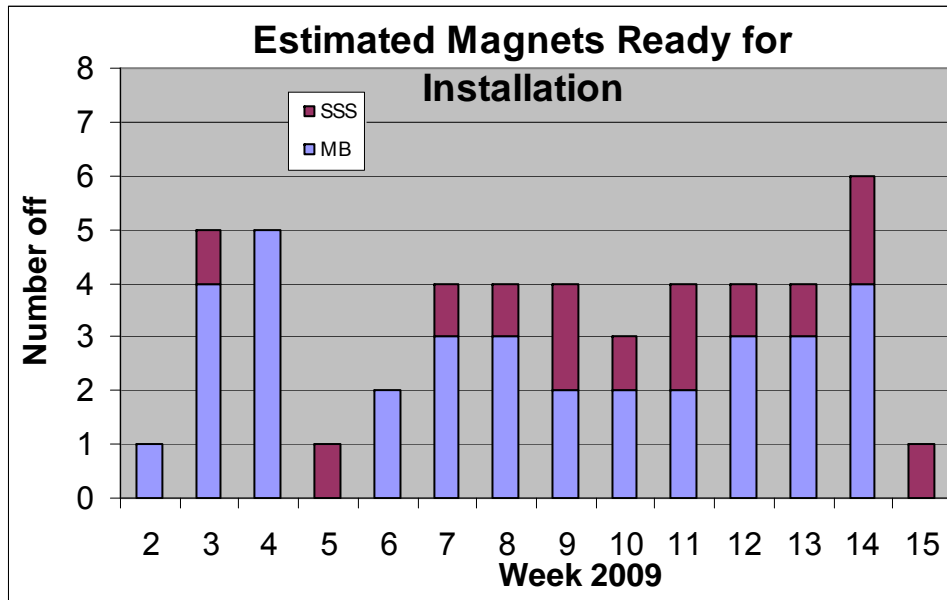


- MB2334 (B16R1 from 1-2) 100 n Ω : opened, inter-pole splice poor bonding

- MB2303 (B32R6 from 6-7) 50 n Ω : at SMI2 preparing for cold testing

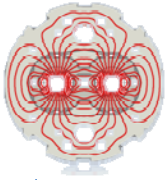


Transport and installation



- MB from Point 3, SSS from Point 4;
- MB finished W16, OK for cooling down 2-3;
- Last 2 SSS in W18;
- Night shift and Saturday work since W10 (to avoid coactivity).

Courtesy C. Bertone, O. Capatina, R. Bihery



Installation Week 14/2009

Secteur 3-4

Situation semaine 14/09 (au 03.04.09)

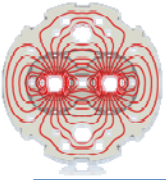
Réinstallation des aimants semaines 15 (06.04.09 au 09.04.09) et 16 (14.04.09 au 17.04.09) + 18/09

<= Point 3

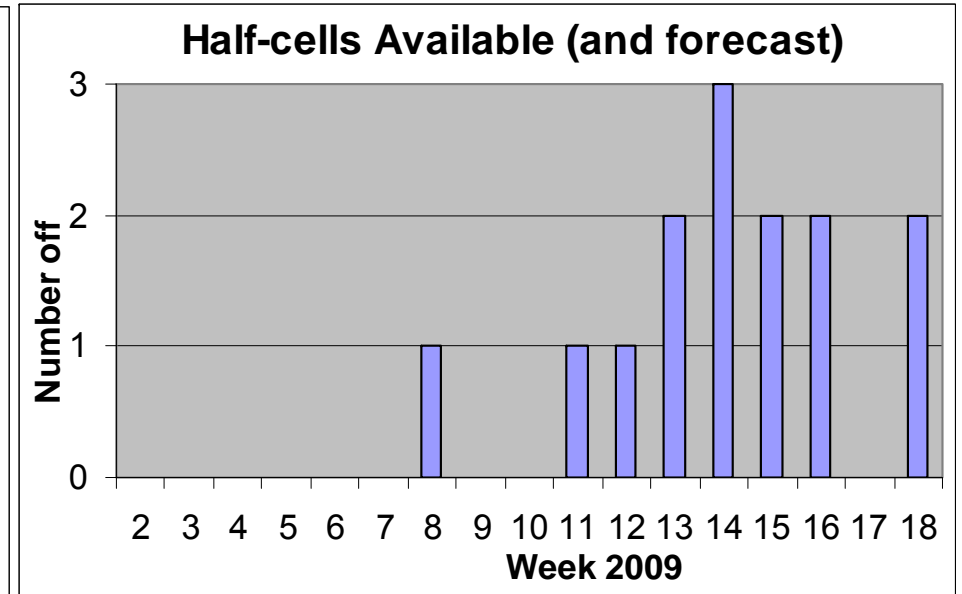
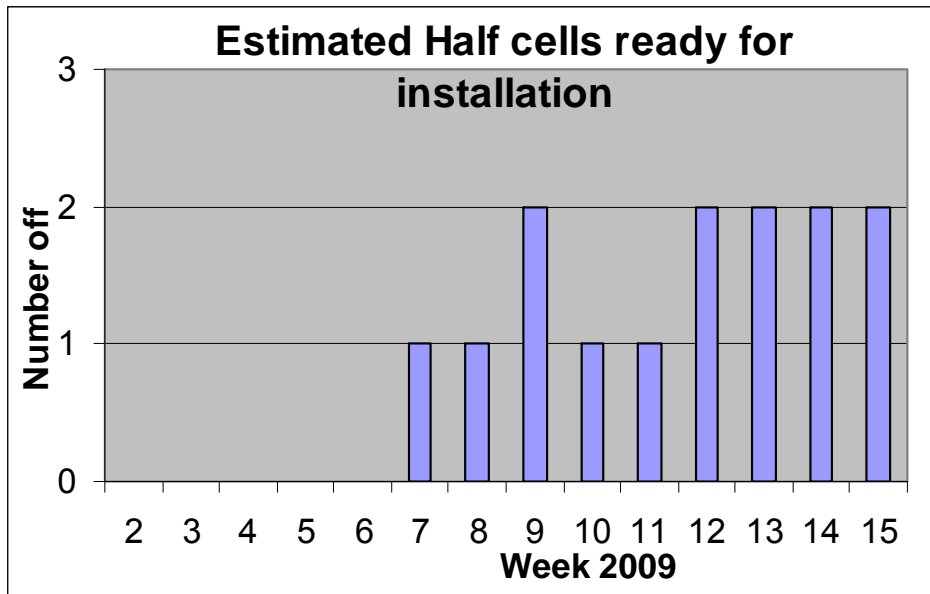
Function	A	B	C	Q WITH JUMPER	A	B	C	Q
Sub-sector G	07.04.09				14.04.09			
	LBBLA 3115	LBALA 1091	LBLBLD 3099	SSS228	LBALA 3152	LBBLA 1130	LBALB 2054	SSS195
Dcum (start)	7479.2 C18R8	7494.8	7510.5	7526.1 Q19	7532.6 C20R8 A20	7548.3 B20	7563.9 C20	7579.6 Q20
Sub-sector G	07.04.09				14.04.09			
	LBBLA 2035	LBALA 1092	LBLBLD 1099	SSS225	LBALA 1085	LBBLA 3118	LBALB 1071	SSS203
	Dcum (start)	7586.1 C21R8 A21	7601.70 B21	7617.4 C21	7633.0 Q21	7639.5 C22R8 A22	7655.2 B22	7670.8 C22
Sub-sector G	08.04.09				14.04.09			
	LBALA 2430	LBALA 2790	LBLBLD 2399	SSS243	LBALA 2436	LBBLA 2434	LBALB 2439	SSS 277
Dcum (start)	7693.0 C23R8 A23	7708.6 B23	7724.3 C23	7739.9 Q23	7746.4 C24R8 A24	7762.1 B24	7777.7 C24	7793.4 Q24
Sub-sector F	09.04.09				03.04.09			
	LBBLA 2103	LBALA 2739	LBLBLD 2422	SSS219	LBALA 2438	LBBLA 2433	LBALB 2598	SSS208
Dcum (start)	7799.9 C26R8 A25	7815.5 B25	7831.2 C25	7846.8 Q25	7853.3 C28R8 A26	7869.0 B26	7884.6 C26	7900.3 Q26
Sub-sector F	15.04.09				15.04.09			
	LBBLA 2428	LBALA 2690	LBLBLD 1219	SSS055	LBALA 2437	LBBLA 2421	LBALB 2551	SSS369
	Dcum (start)	7906.8 C27R8 A27	7922.4 B27	7938.1 C27	7953.7 Q27	7960.2 C28R8 A28	7975.9 B28	7991.5 C28
Sub-sector F	16.04.09				16.04.09			
	LBBLA 2419	LBALA 2342	LBLBLD 2418	SSS221	LBALA 2435	LBBLA 2427	LBBLA 2444	SSS344
Dcum (start)	8013.7 C28R8 A29	8029.3 B29	8045.0 C29	8060.6 Q29	8067.1 C30R8 A30	8082.8 B30	8098.4 C30	8114.1 Q30
Sub-sector F	16.04.09				16.04.09			
	LBBLA 2440	LBALA 3413	LBLBLD 2429	SSS364	LBALA 2624	LBBLA 2252	LBBLA 2443	SSS279
Dcum (start)	8120.6 C31R8 A31	8136.2 B31	8151.9 C31	8167.5 Q31	8174.0 C32R8 A32	8189.7 B32	8205.3 C32	8221 Q32
Sub-sector E	16.04.09				16.04.09			
	LBBLA 3383	LBALA 2192	LBLBLD 2108	SSS227	LBALA 2177	LBBLA 1100	LBALB 1245	LQOBK 0202
Dcum (start)	8227.5 C33R8 A33	8243.1 B33	8258.6 C33	8274.4 Q33	8280.9 C34R8	8296.6	8312.2	8327.9

Point 4 =>

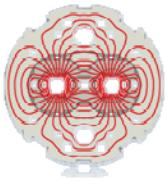
Courtesy H. Gaillard



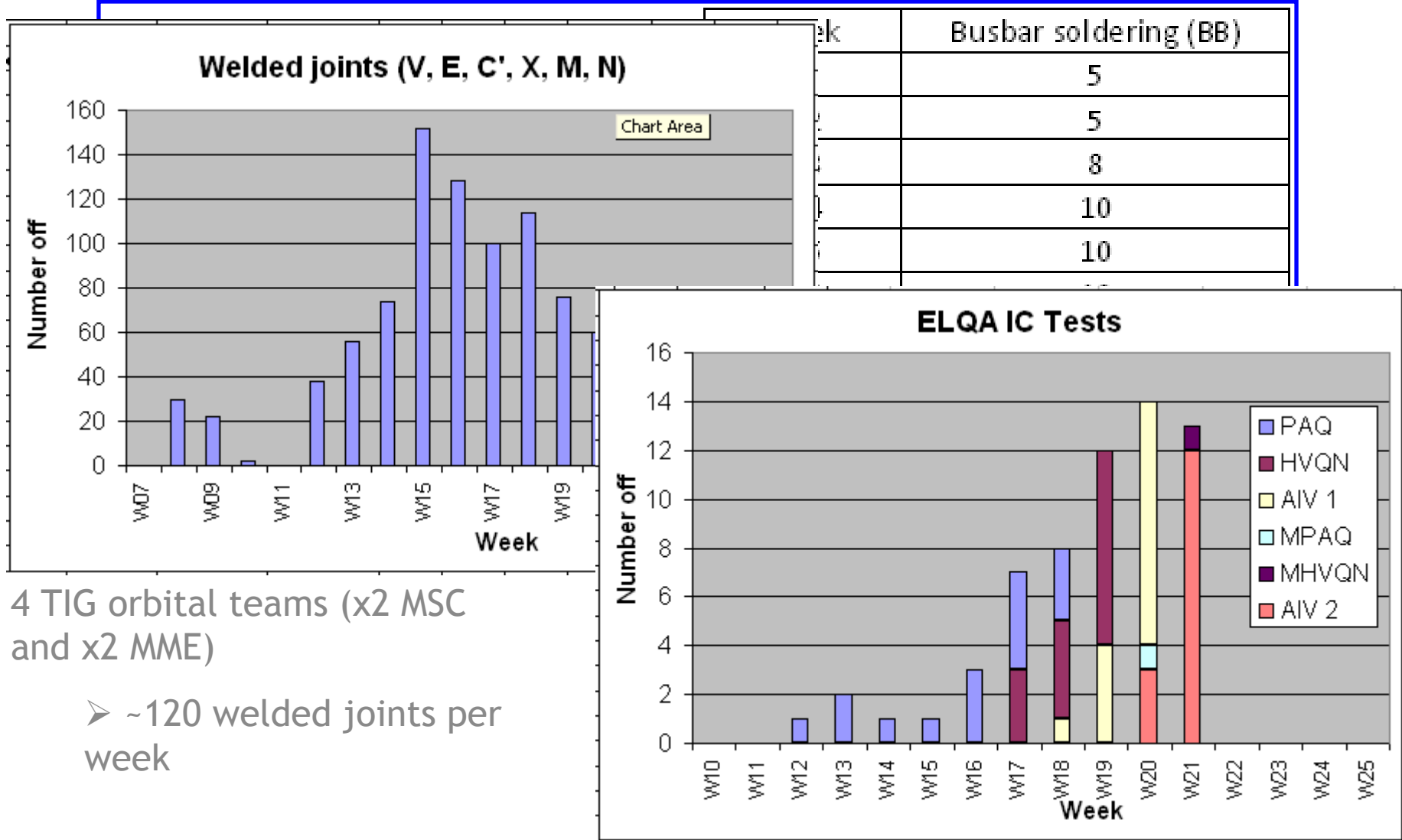
Half-cells available for IC



- IC work has become available later and less evenly;
- IC work had to adapt to perform “any available” work;
- important efforts from Survey and Pre-inspection teams to make IC work available very soon after magnet installation.

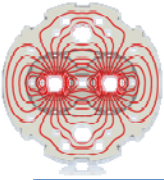


3-4 resources



4 TIG orbital teams (x2 MSC and x2 MME)

➤ ~120 welded joints per week



Tunnel News Week 14/2009

IC	Inst	Align	Pre-insp	Start	BR	SP	V	E	C'	Y+X	M
QBQI.19R3											
QQBI.19R3											
QBBI.A20R3											
QBBI.B20R3											
QBQI.20R3											
QQBI.20R3	7/Apr	8-4 AM	8-4 PM								
QBBI.A21R3	7/Apr	8-4 AM	8-4 PM								
QBBI.B21R3	8/Apr	9-4 AM	9-4 PM								
QBQI.21R3	8/Apr	9-4 AM	9-4 PM								
QQBI.21R3											
QBBI.A22R3											
QBBI.B22R3	15/Apr										
QBQI.22R3	15/Apr										
QQBI.22R3											
QBBI.A23R3											
QBBI.B23R3											
QBQI.23R3											
QQBI.23R3											
QBBI.A24R3											
QBBI.B24R3											
QBQI.24R3											
QQBI.24R3											
QBBI.A25R3											
QBBI.B25R3											
QBQI.25R3	9/Apr	14/Apr									
QQBI.25R3	9/Apr	14/Apr									
QBBI.A26R3	6/Apr	7-4 AM	7-4 PM								
QBBI.B26R3	6/Apr	7-4 AM	7-4 PM								
QBQI.26R3	3/Apr	6/Apr	7-4 AM								

Damaged spools
Cut strands

Resistance M3

	BR	SP	V	E	M
W13	8	6	7	8	0
W14	9	7	10	11	3

IC	Inst	Align	Pre-insp	Start	BR	SP	V	E	C'	Y+X	M
QBQI.26R3	3/Apr	6/Apr	7-4 AM								
QBBI.A27R3											
QBBI.B27R3											
QBQI.27R3											
QQBI.27R3	15/Apr										
QBBI.A28R3	15/Apr										
QBBI.B28R3											
QBQI.28R3											
QBBI.A29R3											
QBBI.B29R3											
QBQI.29R3											
QBBI.A30R3											
QBBI.B30R3											
QBQI.30R3											
QBBI.A31R3											
QBBI.B31R3											
QBQI.31R3											
QBBI.A32R3											
QBBI.B32R3											
QBQI.32R3											
QBBI.A33R3	17/Apr										
QBBI.B33R3	3/Apr	3/Apr	6-4 AM								
QBQI.33R3	3/Apr	6-4 AM	6-4 PM								
QBBI.B33R3	3/Apr	6-4 AM	6-4 PM								

Broken cable

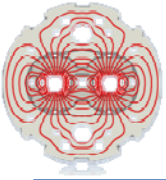
Resistance M1 + Short spools

Resistance M1

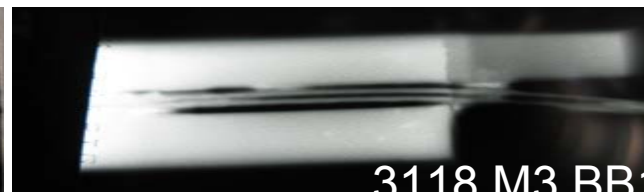
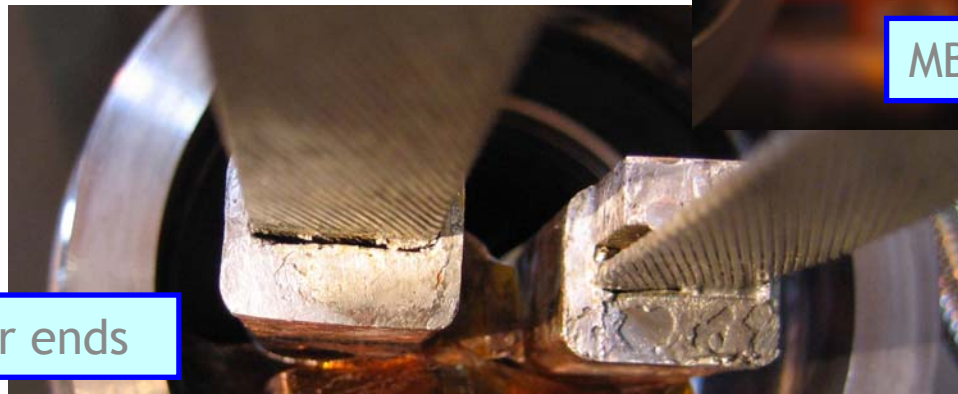
Done current week
Done
Started
Blocked
Blocked by MCR
Next activities

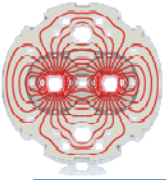
- Good progression but need to clear NC issues fast
- find “correct” balance of Quality and productivity, specifically w.r.t. rest of the machine

Courtesy A. Musso

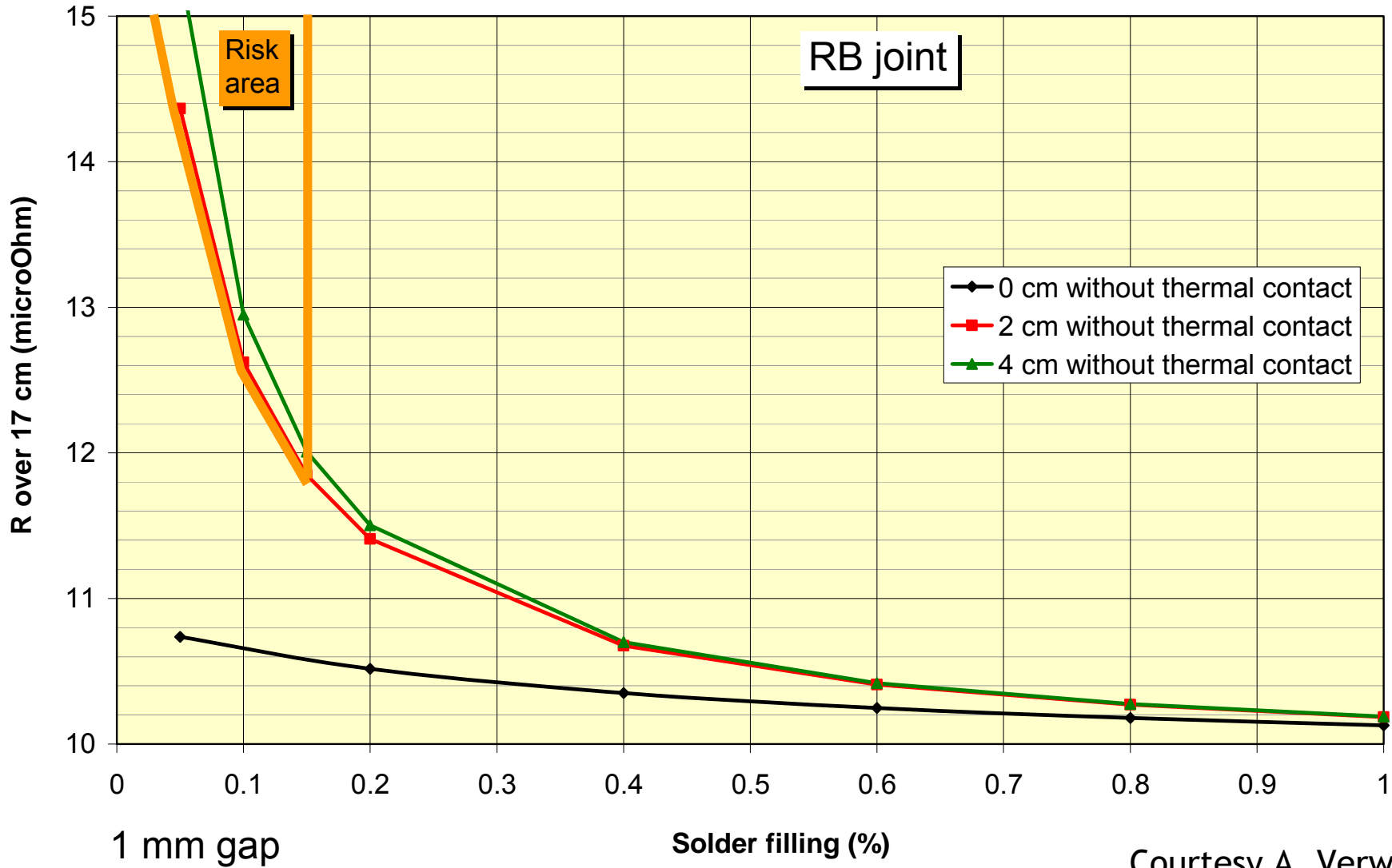


Technical difficulties

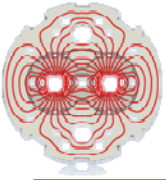




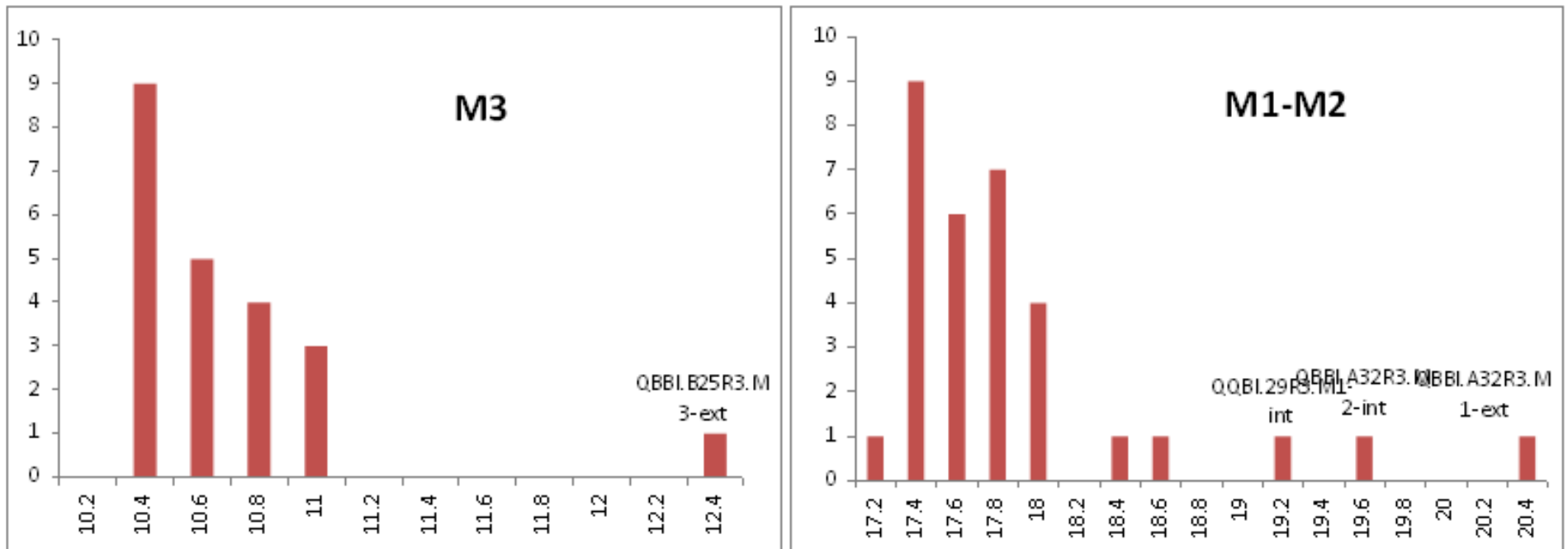
Gap + missing Sn



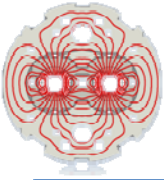
Courtesy A. Verweij



Splice Megger measurements

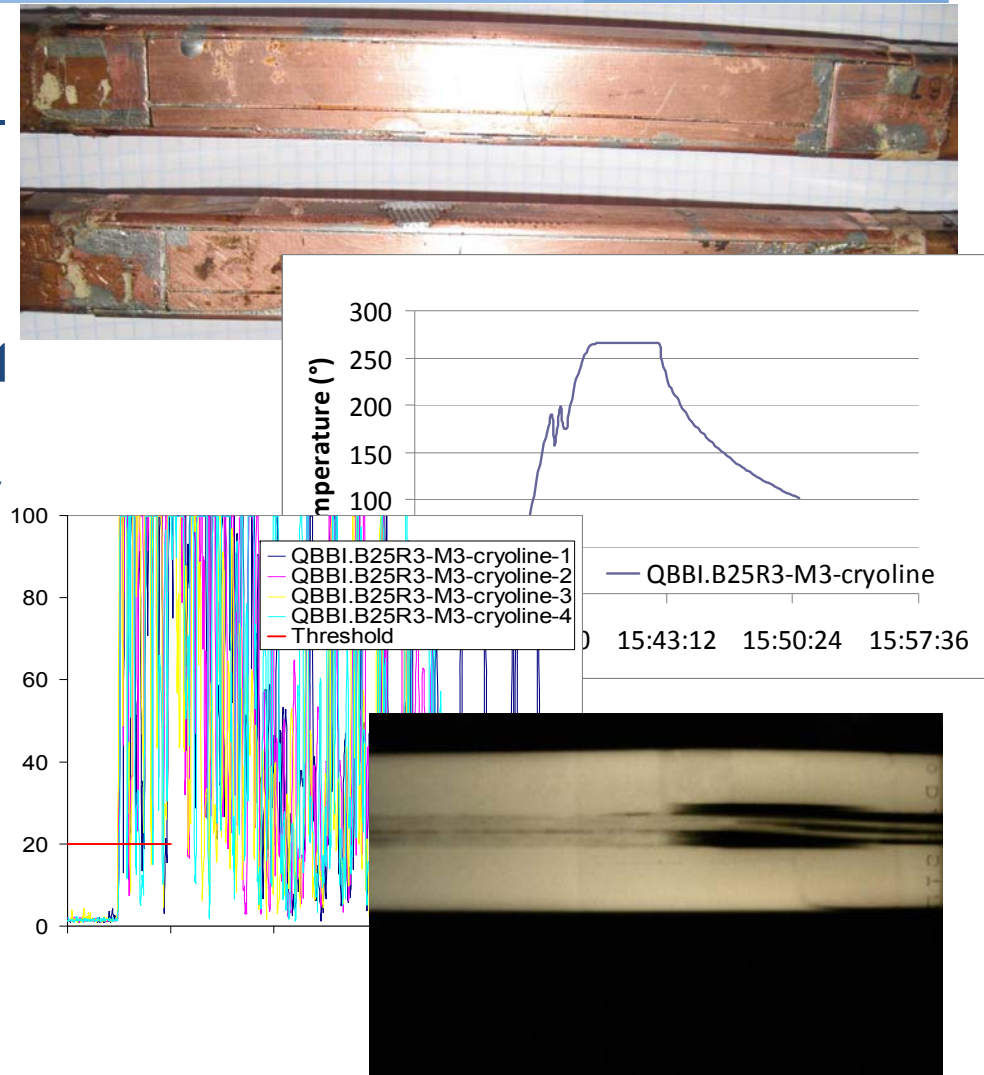


- Gap splices OK, outliers in cases without visible gap
 - Splice NCRs blocking work (PAQ and M welding): urgent to resolve this (already 1 week delay)
 - Gammas done OK; resistance measurements in 5-6 and 6-7 ongoing
 - Proposal (to be discussed): resolder if $\text{gap} \geq 50\%$ AND resistance $\geq \dots\%$, otherwise record but use as is
- Courtesy C. Scheuerlein, N. Catalan, G. D'Angelo, R. Mompoti

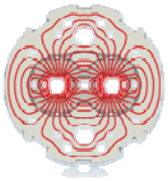


Example QC of QBBI.B25R3

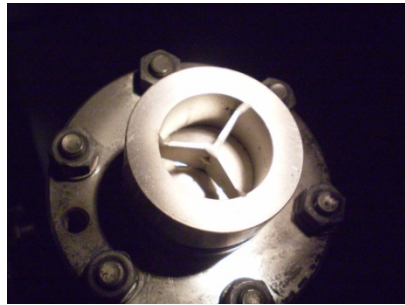
- Produced the 17.3.2009. Special U-piece (-1 mm length) used for M3-corridor side. OK
- Visual and geometric inspection by QC team according to IEG-C-BR-001 rev C, the 18.3.2009. OK
- US-test 4 out of 4 US signals OK for all splices.
- Splice thickness OK.
- NCR 993939 was opened and gamma ray examination was requested for QBBI.B25R3-M3-cryoline, because room temperature splice resistance of $12.4 \mu\Omega$ is higher than average values.



Courtesy C. Scheuerlein



Beam Vacuum Recovery: Evaluation of damage



Q8R3 V1: rupture disk deformed but not perforated

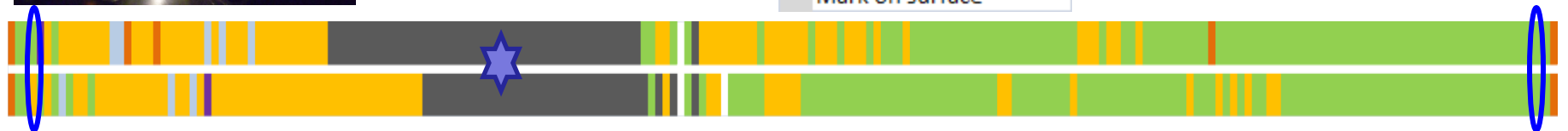
4800 m of beam pipe inspected cm-by-cm and documented with travellers, pictures and videos !



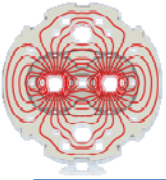
Q8R3 V2: rupture disk blown

■	Metallic debris
■	MLI
■	OK
■	Soot
■	Oxidized beam screen
■	Mark on surface

Q8L4 V1/V2: rupture disk deformed but not perforated



Courtesy M. Jimenez

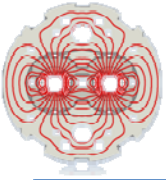


Beam Vacuum Recovery: Sequence and Numbers

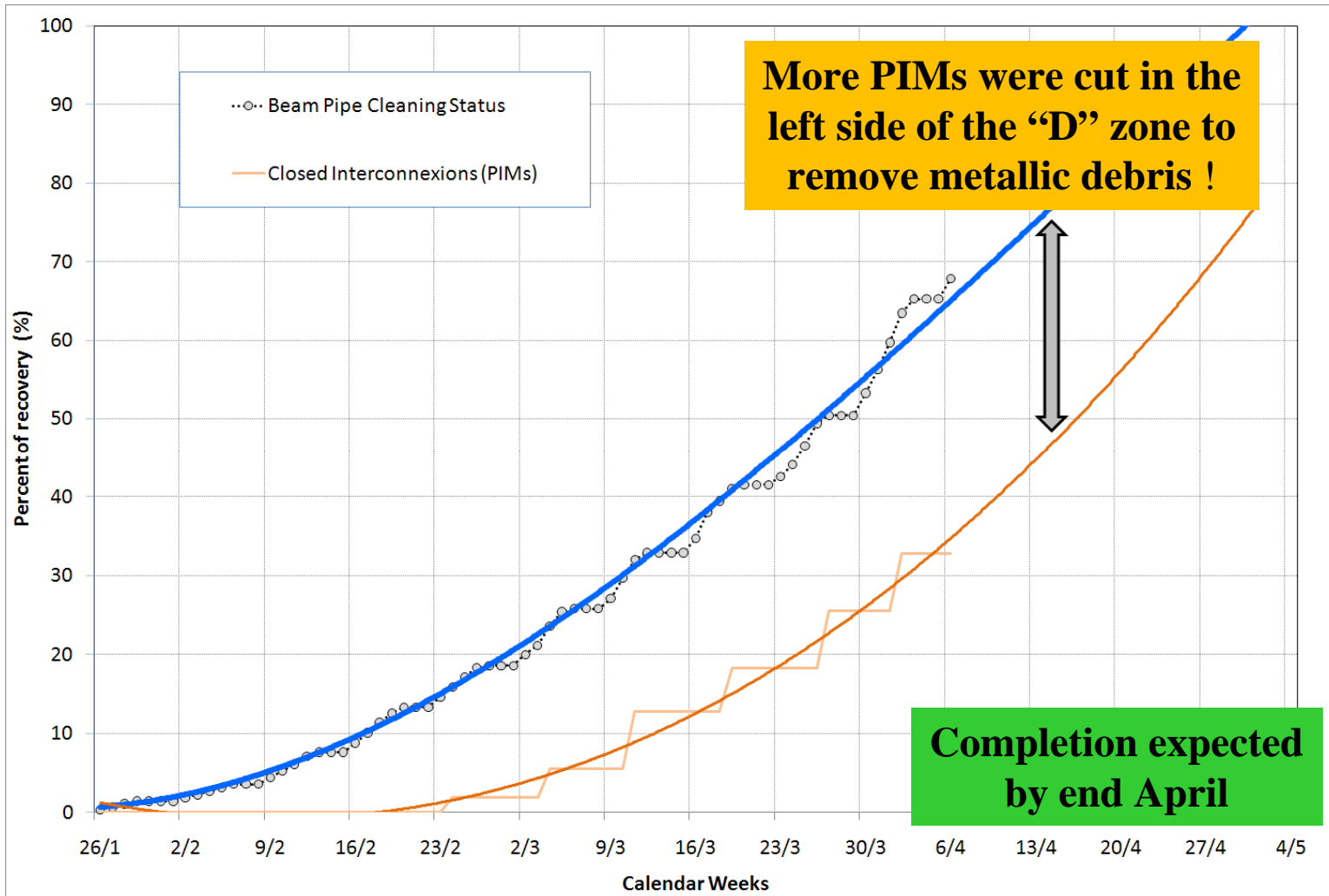
- Beam Pipe Cleaning: some numbers
 - 4800 m of Beam Vacuum Pipe to be cleaned
 - 10 passages / Beam Line
 - 1 passage for final endoscopic inspection
 - ☞ 52'800 m to be worked out cm-by-cm !
 - Today's Status
 - 68 % of the length is cleaned - right to the "D" zone
 - ☞ 35'900 m !
- 110 PIMs cut to allow for cleaning
 - 59 left to the "D" zone (in 3R side)
 - 51 right to the "D" zone (in 4L side)
 - ☞ 33 % only are re-welded
 - ☞ More PIMs were cut in the left side of the "D" zone to remove metallic debris

**Many thanks to TE-VSC,
CERCO and AL43 staff
for their great commitment**

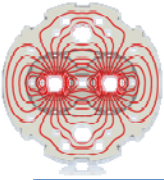
Courtesy M. Jimenez



Beam Vacuum Recovery: % of Cleaned Beam Pipes



Courtesy M. Jimenez



Tunnel News: first W closures

Planning fermeture IC
en remettant le 1-2
avant le 6-7.

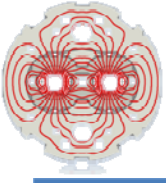
Secteur	1-2	3-4	5-6	6-7	Total	Cumule
W13			2		2	2
W14			3		3	5
W15			3		3	8
W16			3		3	11
W17	2		2		4	15
W18	3		1		4	19
W19	6				6	25
W20	3			3	6	31
W21				6	6	37
W22		1		5	6	43
W23		6			6	49
W24		7			7	56
W25					0	56
W26					0	56
W27					0	56
TOTAL	14	14	14	14		

ELQA

CoolDown

- Planning for closures with VSC
- W13: first 3 VAC subsectors pumping in 5-6 (A19R5, A23R5, A31R5)

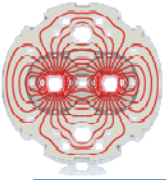
Courtesy J.P. Tock



Conclusions

- Finish IC work W26 (close W bellows) - if we recuperate 1 week welding delay from electrical NCR;
- Priority now: clear quality criteria for 13 kA splices

Thanks for your attention



13 kA splice

