LHC Risk Review 5-7 March 2009

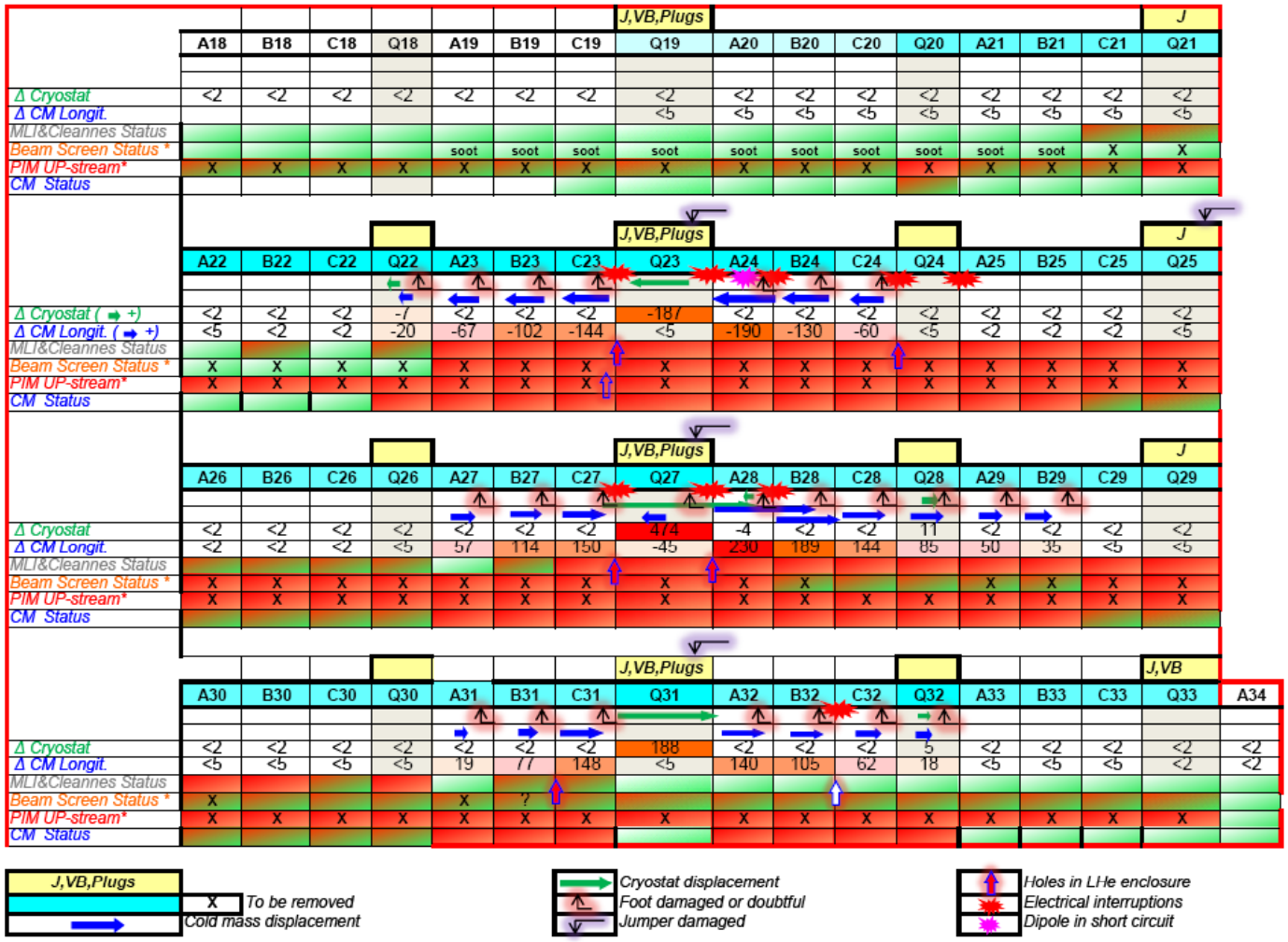
Magnet Situation, including Spares

(M.Modena)

Which is the extent of the magnets damage?

Sector 3-4 Event Findings and Observations Summary

← Point 3 *(Based on investigation and measurements by AT-MCS, AT-MEI, AT-VAC, TS-MME and TS-SU)* Point 4 →



(Note: some PIMs and some random minor CBT pollution also OUTSIDE zone Q19-Q33 (up to Q7.R3 and Q7.L4))*

M.Modena, TE-MSC 4-Mar-09

- ***39 dipoles and 14 SSS to be removed.***
- ***30 NEW dipoles and 7 NEW SSS to be installed.***
- ***For the remaining 9 dipoles and 7 SSS: → reparations (minor), re-test and re-installation.***
- ***PLUS 2 dipoles for replacement in S.1-2 and S.6-7.***

SPARES (and other) C.M. and CRYOMAGNETS GENERAL STATUS

STEPS	DIPOLE			
	TYPE A		TYPE B	
	QTY	ID	QTY	ID
COLD MASS (not cryostated, not tested)	11	2739 / 2868 / 2435 / 2436 / 2437 / 2438 / 2443 / 2444 / 2445 / 2446 / 2524	13	2399 / 2418 / 2421 / 2422 / 2428 / 2429 / 2431 / 2432 / 2433 / 2434 / 2440 / 2441 / 2442
CRYOSTATING DONE	3	2690 / 2439 / 1055 (sick magnet)	2	3383 / 2420
COLD TEST DONE * waiting for PA	4	2551* / 2598 / 2624* / 2790	3	2252* / 2427* / 2419*
STRIPPING DONE	0		0	
FIDUCIALISATION DONE	1	1011	1	2430
BEAM SCREEN INTEGRATED	2	2342 / 3413	1	1219
READY FOR TUNNEL	0		0	
TOTAL	**21**		**20**	

Legend
blue: diode L
red: diode R
black: no diode

3-4 sector
L- diodes
L-Beam screen

STEPS	SSS					
	ARC		DS		MS	
	QTY	ID	QTY	ID	QTY	ID
COLD MASS (not cryostated, not tested)	12	005 / 055 / 072 / 243 / 277 / 279 / 344 / 364 / 367 / 369 / 372 / 080(leak under invest.)				
CRYOSTATING DONE	1	006 (under test in test-cryostat)	1	603		
COLD TEST DONE * waiting for PA	1	064*				
STRIPPING DONE						
FIDUCIALISATION DONE						
BEAM SCREEN & BPM INTEGRATED			1	523 (used for warm-up test)		
READY FOR TUNNEL						
TOTAL	**14**		**2**			

UPDATED	01-10-08	BY	N.Bourcey AT/MCS/CI

Spares Situation (MB and SSS) as on few days after the incident of S.3-4:

- ***5 MB "well advanced" for the Tunnel; other 7 becoming available in short time; other 4 in a longer time (still to be tested at SM18). Total: 16 MB in the pipeline***
- ***NO Arc-SSS were ready for the tunnel, no one in the pipeline (as expected).***

Sector 3-4: Status and SSS spares (allocation last update 27 Feb 2009)

POSITION	NAME	POSITION	FUNCTION	JUMPER	VB & PLUG	PT821	MAGNET ID.	MQ needed	MSCB needed	MO/MQT,MQS needed	Diode polarity	COMMENT	New proposed pre-allocation
7526.1315	LQATD.19R3	7526.1315	Q19R3	X	X		228	D/F	MSCBB	MQT	B		(remains in the Tunnel)
7579.5815	LQATS.20R3	7579.5815	Q20R3				195	F/D	MSCBA	MQT	A		SSS RE-TESTED
7633.0315	LQATA.21R3	7633.0315	Q21R3	X		X	225	D/F	MSCBB	MQT	B		SSS RE-TESTED
7686.4815	LQOBA.22R3	7686.4815	Q22R3				203	F/D	MSCBA	MO	A		SSS RE-TESTED
7739.9315	LQASB.23R3	7739.9315	Q23R3	X	X		233	D/F	MSCBB	MQS	B	X	SSS243
7793.3815	LQOBA.24R3	7793.3815	Q24R3				199	F/D	MSCBA	MO	A		SSS277
7846.8315	LQOAA.25R3	7846.8315	Q25R3	X		X	219	D/F	MSCBB	MO	B		test existing SSS
7900.2815	LQOBA.26R3	7900.2815	Q26R3				208	F/D	MSCBA	MO	A		test existing SSS
7953.7315	LQASB.27R3	7953.7315	Q27R3	X	X		230	D/F	MSCBB	MQS	B	X	SSS055
8007.1815	LQOBA.28R3	8007.1815	Q28R3				198	F/D	MSCBA	MO	A	X	SSS369
8060.6315	LQOAI.29R3	8060.6315	Q29R3	X		X	221	D/F	MSCBD	MO	B		SSS RE-TESTED
8114.0815	LQOBK.30R3	8114.0815	Q30R3				204	F/D	MSCBC	MO	A		SSS006
8167.5315	LQOAC.31R3	8167.5315	Q31R3	X	X		192	D/F	MSCBB	MO	B		SSS364
8220.9815	LQOBA.32R3	8220.9815	Q32R3				200	F/D	MSCBA	MO	A	X	SSS279
8274.4315	LQOAK.33R3	8274.4315	Q33R3	X	VB only		227	D/F	MSCBD	MO	B		SSS RE-TESTED

PROPOPOSED Spares (by AT-MCS/AB-ABP):

SSS in RED --> "new" c.m. to be cryosteted&tested
SSS in BLUE--> c.m. in the pipe-line not yet tested
SSS in GREEN --> c.m. in the pipe-line already tested
X= NOT conform spares compare to former LHC Layout

- During the cold test of SPARE magnets several problems appeared and obliged to **REJECT** a magnet (*2420*) and **RE-TEST** several others (*2427, 2690, 3383, 2868* (the last two still ongoing)

- (Final) decision of few days ago to not take extra risk and **SUBSTITUTE** the 7th SSS (192 in Q31) that, despite not showing major visual damages, has caused the "pull&push" of several other dipoles. For this SSS we have a spare available but it was left beside since slightly deteriorating the magnetic quality of the Sector.

- NOTE: the pre-allocation of the magnets, the tackling of the NEW problems appeared on the spares (mainly the consequent revision of the pre-allocation) is done together with BE-ABP through the Magnet Evaluation Board (**MEB**) activities (MEB meetings restarted few weeks after the incident).

Where we are now?

Status	Quantity	SSS & MB Identity
MB cold mass spare still available	*6*	*Type A= 2437- **2438** -2445-2524* *Type B= **2431-2442***
SSS cold mass	**1**	SSS279
MB at cryostating or preparation for cold test	**1**	3383
SSS at cryostating or preparation for cold test	**1**	**SSS219**
MB at cold test	**8**	**1071-1092-1099-2035-2108-2192-2441**-2433
SSS at cold test	**1**	**SSS208**
MB at Stripping and Fiducialization	**9**	2427-2428-2443-2446-2690-**1085-(2103-2868)-3118**
SSS at Stripping and Fiducialization	**5**	SSS006-SSS364-**SSS195-SSS225-SSS227**
MB at SMI2 (beam sceen & BPM)	**3**	2418-2435-2444
SSS at SMI2 (beam sceen & BPM)	**2**	**SSS203-SSS221**
MB at Storage before installation	**0**	
SSS at Storage before installation	**0**	
MB at preparation for tunnel	**4**	2252-2421-2429-2440
SSS at preparation for tunnel	**1**	SSS369
MB Installed	**16**	1219-2342-2739-2399-2419-2422-2430-**2432**-2434-2436-2439-2551-2598-2624-2790-3413
SSS Installed	**3**	SSS055-SSS243-SSS277

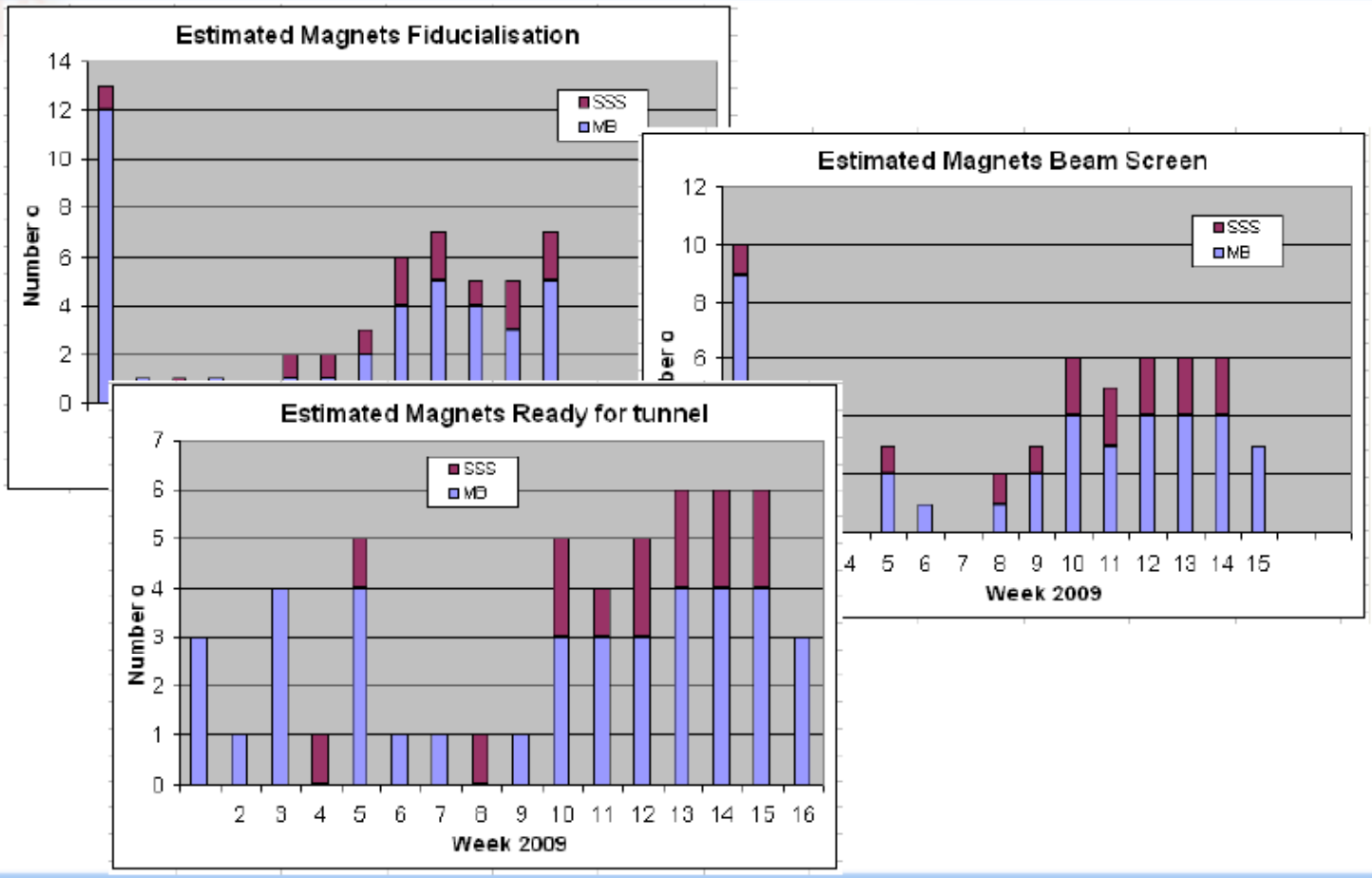
RED : Magnet blocked

GREEN : Magnet arriving from S.3-4 (to be RE-INSTALLED)

MB2432 = for sector 1-2 / MB2441 = for sector 6-7

MB spares (total)	41	/41
SSS spares (total)	14	/14

Surface News Week 09/2009



2 March, 2009 MMM and TEMB - Francesco Bertinelli 4

*•The target for the PRODUCTION RATE (average for all activities) for the last weeks is **6** magnet/weeks.*

•Some activities (ex. Cold Test) are now in good shape, other activities (ex. Beam Screen installation) will needs more attentions and actions.

PLANNING CRYOMAGNETS ASSEMBLY AT SURFACE

UPDATED 3/4/2009

SECTOR	SLOT	POSITION	NEW MAGNET ID	OLD MAGNET ID	END DECRYOSTATING	END CRYOSTATING	END PREPA FOR COLD TESTS	END COLD TESTS	STRIPPING & POLARITY TEST	FIDUCIALISATION	END BS INTEGRATION	PREPARATION FOR TUNNEL	READY FOR INSTALLATION
3-4	LQATD.19R3	Q19R3	228	228	STAY IN THE TUNNEL								
	LBALA.20R3	A20	3152	3152	STAY IN THE TUNNEL								
	LBBLA.20R3	B20	1130	1130	STAY IN THE TUNNEL								
	LBALB.20R3	C20	2054	2054	STAY IN THE TUNNEL								
	LQATS.20R3	Q20R3	195	195	N.A.	N.A.	W 4 2009 / W 6 2009	W 7 2009 / W 8 2009	W 8 2009 / W 9 2009	W 8 2009 / W 9 2009	W 9 2009 / W 10 2009	W 10 2009 / W 11 2009	W 10 2009 / W 11 2009
	LBBLA.21R3	A21	2035	2035	N.A.	N.A.	W 5 2009 / W 6 2009	W 10 2009 / W 12 2009	W 11 2009 / W 13 2009	W 11 2009 / W 13 2009	W 11 2009 / W 15 2009	W 12 2009 / W 16 2009	W 12 2009 / W 16 2009
	LBALA.21R3	B21	1092	1092	N.A.	N.A.	W 6 2009 / W 8 2009	W 11 2009 / W 11 2009	W 12 2009 / W 12 2009	W 12 2009 / W 12 2009	W 13 2009 / W 13 2009	W 14 2009 / W 14 2009	W 14 2009 / W 14 2009
	LBBLD.21R3	C21	1099	1099	N.A.	N.A.	W 6 2009 / W 7 2009	W 10 2009 / W 11 2009	W 11 2009 / W 12 2009	W 11 2009 / W 12 2009	W 12 2009 / W 14 2009	W 13 2009 / W 15 2009	W 13 2009 / W 15 2009
	LQATA.21R3	Q21R3	225	225	W / W	W 7 2009 / W 7 2009	N.A.	W 10 2009 / W 9 2009	W 11 2009 / W 10 2009	W 11 2009 / W 10 2009	W 12 2009 / W 12 2009	W 13 2009 / W 13 2009	W 13 2009 / W 13 2009
	LBALA.22R3	A22	1085	1085	N.A.	N.A.	W 2 2009 / W 2 2009	W 5 2009 / W 6 2009	W 6 2009 / W 7 2009	W 6 2009 / W 7 2009	W 7 2009 / W 11 2009	W 8 2009 / W 12 2009	W 8 2009 / W 12 2009
	LBBLA.22R3	B22	3118	3118	N.A.	N.A.	W 3 2009 / W 4 2009	W 8 2009 / W 8 2009	W 9 2009 / W 11 2009	W 9 2009 / W 11 2009	W 10 2009 / W 12 2009	W 11 2009 / W 13 2009	W 11 2009 / W 13 2009
	LBALB.22R3	C22	1071	1071	N.A.	N.A.	W 4 2009 / W 8 2009	W 8 2009 / W 12 2009	W 9 2009 / W 13 2009	W 9 2009 / W 13 2009	W 10 2009 / W 14 2009	W 11 2009 / W 15 2009	W 11 2009 / W 15 2009
	LQOBA.22R3	Q22R3	203	203	W --- --- / W done	W 4 2009 / W 5 2009	N.A.	W 6 2009 / W 8 2009	W 7 2009 / W 9 2009	W 7 2009 / W 9 2009	W 8 2009 / W 10 2009	W 9 2009 / W 11 2009	W 9 2009 / W 11 2009
	LBBLA.23R3	A23	2430	1236	N.A.	W --- --- / W 20 2008	N.A.	W --- --- / W 31 2008	W --- --- / W 34 2008	W --- --- / W 40 2008	W --- --- / W 43 2008	W 3 2009 / W 3 2209	W 3 2009 / W 3 2009
	LBALA.23R3	B23	2790	2193	N.A.	W --- --- / W	N.A.	W --- --- / W 40 2008	W --- --- / W 43 2008	W --- --- / W 44 2008	W --- --- / W 46 2008	W --- --- / W 47 2008	W --- --- / W 48 2008
	LBBLD.23R3	C23	2399	1109	N.A.	W --- --- / W 47 2008	N.A.	W 3 2009 / W 3 2009	W 4 2009 / W 4 2009	W 4 2009 / W 4 2009	W 5 2009 / W 5 2009	W 6 2009 / W 6 2009	W 6 2009 / W 7 2009
	LQASB.23R3	Q23R3	243	233	N.A.	W --- --- / W 50 2008	N.A.	W 4 2009 / W 4 2009	W 5 2009 / W 5 2009	W 5 2009 / W 6 2009	W 6 2009 / W 8 2009	W 7 2009 / W 8 2009	W 7 2009 / W 8 2009
	LBALA.24R3	A24	2436	1241	N.A.	W --- --- / W 45 2008	N.A.	W --- --- / W 49 2008	W --- --- / W 51 2008	W --- --- / W 51 2008	W 4 2009 / W 5 2009	W 5 2009 / W 5 2009	W 5 2009 / W 5 2009
	LBBLA.24R3	B24	2434	2055	N.A.	W --- --- / W 42 2008	N.A.	W --- --- / W 51 2008	W --- --- / W 2 2009	W --- --- / W 2 2009	W 4 2009 / W 5 2009	W 5 2009 / W 5 2009	W 5 2009 / W 5 2009
	LBALB.24R3	C24	2439	3110	N.A.	W / W 34 2008	N.A.	W / W 47 2008	W / W 47 2008	W / W 48 2008	W / W 50 2008	W 3 2009 / W 3 2009	W 3 2009 / W 3 2009
	LQOBA.24R3	Q24R3	277	199	N.A.	W --- --- / W 44 2008	N.A.	W --- --- / W 48 2008	W --- --- / W 48 2008	W --- --- / W 48 2008	W --- --- / W 51 2008	W 3 2009 / W 4 2009	W 3 2009 / W 4 2009
	LBBLA.25R3	A25	3383	1132	N.A.	W --- --- / W 27 2008	W 10 2009 / W 10 2009	W 11 2009 / W 12 2009	W 12 2009 / W 13 2009	W 12 2009 / W 13 2009	W 13 2009 / W 15 2009	W 14 2009 / W 16 2009	W 14 2009 / W 16 2009
	LBALA.25R3	B25	2739	1084	N.A.	W 2 2009 / W 2 2009	N.A.	W 5 2009 / W 5 2009	W 6 2009 / W 6	W 6 2009 / W 6	W 7 2009 / W 8 2009	W 8 2009 / W 8 2009	W 8 2009 / W 9 2009
	LBBLD.25R3	C25	2422	3096	N.A.	W --- --- / W 41 2008	N.A.	W --- --- / W 49 2008	W --- --- / W 50 2008	W --- --- / W 50 2008	W --- --- / W 2 2009	W 4 2009 / W 5 2009	W 4 2009 / W 5 2009
	LQOAA.25R3	Q25R3	219	219	W 6 2009 / W 6 2009	W 7 2009 / W 10 2009	N.A.	W 10 2009 / W 11 2009	W 11 2009 / W 12 2009	W 11 2009 / W 12 2009	W 13 2009 / W 14 2009	W 14 2009 / W 15 2009	W 14 2009 / W 15 2009
	LBALA.26R3	A26	2446	1242	N.A.	W 4 2009 / W 4 2009	N.A.	W 8 2009 / W 8 2009	W 9 2009 / W 10 2009	W 9 2009 / W 11 2009	W 11 2009 / W 12 2009	W 12 2009 / W 12 2009	W 12 2009 / W 12 2009
	LBBLA.26R3	B26	2433	2111	N.A.	W 5 2009 / W 6 2009	N.A.	W 9 2009 / W 12 2009	W 10 2009 / W 13 2009	W 10 2009 / W 13 2009	W 11 2009 / W 14 2009	W 12 2009 / W 15 2009	W 12 2009 / W 15 2009
	LBALB.26R3	C26	2596	2100	N.A.	W --- --- / W done	N.A.	W --- --- / W 39 2008	W --- --- / W 41 2008	W --- --- / W 41 2008	W --- --- / W 44 2008	W --- --- / W 50 2008	W --- --- / W 51 2008
	LQOBA.26R3	Q26R3	208	208	W / W	W 6 2009 / W 9 2009	N.A.	W 9 2009 / W 11 2009	W 10 2009 / W 12 2009	W 10 2009 / W 12 2009	W 11 2009 / W 13 2009	W 12 2009 / W 14 2009	W 12 2009 / W 14 2009

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	LBALB.26R3	C26	2598	2100	N.A.				W	---	---	N.A.				W	---	---	W	---	---	W	---	---	W	---	---	W	---	---	W	---	---
									W	done						W	39	2008	W	41	2008	W	41	2008	W	44	2008	W	50	2008	W	51	2008
3-4	LQOBA.26R3	Q26R3	208	208	W			W	8	2009	N.A.				W	9	2009	W	10	2009	W	10	2009	W	11	2009	W	12	2009	W	12	2009
					W			W	9	2009					W	11	2009	W	12	2009	W	12	2009	W	13	2009	W	14	2009	W	14	2009
	LBBLA.27R3	A27	2427	2043	N.A.			W	---	---	N.A.				W	4	2009	W	5	2009	W	5	2009	W	6	2009	W	7	2009	W	7	2009
								W	done						W	9	2009	W	10	2009	W	10	2009	W	12	2009	W	13	2009	W	13	2009
	LBALA.27R3	B27	2690	1089	N.A.			W	---	---	N.A.				W	---	---	W	5	2009	W	5	2009	W	6	2009	W	7	2009	W	7	2009
								W	12	2008					W	9	2009	W	10	2009	W	10	2009	W	13	2009	W	14	2009	W	14	2009
	LBBLD.27R3	C27	1219	1235	N.A.			W	---	---	N.A.				W	---	---	W	---	---	W	---	---	W	---	---	W	3	2009	W	3	2009
								W	done						W	done		W	done		W	done		W	done		W	3	2009	W	3	2009
	LQASB.27R3	Q27R3	055	230	N.A.			W	---	---	N.A.				W	---	---	W	3	2009	W	3	2009	W	5	2009	W	5	2009	W	5	2009
								W	48	2008					W			W	3	2009	W	3	2009	W	5	2009	W	5	2009	W	5	2009
	LBALA.28R3	A28	2868	1088	N.A.			W	---	---	N.A.				W	5	2009	W	6	2009	W	6	2009	W	7	2009	W	8	2009	W	8	2009
								W	49	2008					W	10	2009	W	11	2009	W	11	2009	W	13	2009	W	14	2009	W	14	2009
	LBBLA.28R3	B28	2421	3120	N.A.			W	---	---	N.A.				W	6	2009	W	7	2009	W	8	2009	W	8	2009	W	9	2009	W	9	2009
								W	2	2009					W	7	2009	W	8	2009	W	8	2009	W	9	2009	W	9	2009	W	10	2009
	LBALB.28R3	C28	2551	3103	N.A.			W	---	---	N.A.				W	---	---	W	---	---	W	---	---	W	---	---	W	---	---	W	---	---
								W	done						W	44	2008	W	44	2008	W	45	2008	W	47	2008	W	2	2009	W	2	2009
	LQOBA.28R3	Q28R3	369	198	N.A.			W	---	---	N.A.				W	5	2009	W	6	2009	W	6	2009	W	7	2009	W	8	2009	W	8	2009
								W	2	2009					W	7	2009	W	7	2009	W	7	2009	W	9	2009	W	10	2009	W	10	2009
	LBBLA.29R3	A29	2419	1112	N.A.			W	---	---	N.A.				W	---	---	W	---	---	W	---	---	W	---	---	W	3	2009	W	3	2009
								W	done						W	48	2008	W	47	2008	W	47	2008	W	49	2008	W	3	2009	W	3	2009
	LBALA.29R3	B29	2342	1061	N.A.			W	---	---	N.A.				W	---	---	W	---	---	W	---	---	W	---	---	W	6	2009	W	6	2009
								W	done						W	45	2008	W	done		W	done		W	done		W	6	2009	W	6	2009
	LBBLD.29R3	C29	2418	2040	N.A.			W	3	2009	N.A.				W	7	2009	W	8	2009	W	8	2009	W	9	2009	W	10	2009	W	10	2009
								W	3	2009					W	8	2009	W	9	2009	W	9	2009	W	10	2009	W	11	2009	W	11	2009
	LQOAI.29R3	Q29R3	221	221	W	---	---	W	4	2009	N.A.				W	6	2009	W	7	2009	W	7	2009	W	8	2009	W	9	2009	W	9	2009
					W	done		W	5	2009					W	7	2009	W	8	2009	W	8	2009	W	10	2009	W	10	2009	W	10	2009
	LBALA.30R3	A30	2435	1154	N.A.			W	4	2009	N.A.				W	9	2009	W	10	2009	W	10	2009	W	12	2009	W	13	2009	W	13	2009
								W	4	2009					W	8	2009	W	10	2009	W	10	2009	W	10	2009	W	11	2009	W	11	2009
	LBBLA.30R3	B30	2428	3409	N.A.			W	5	2009	N.A.				W	5	2009	W	8	2009	W	8	2009	W	9	2009	W	10	2009	W	10	2009
								W	5	2009					W	10	2009	W	11	2009	W	11	2009	W	13	2009	W	14	2009	W	14	2009
	LBALB.30R3	C30	2444	1083	N.A.			W	4	2009	N.A.				W	9	2009	W	10	2009	W	10	2009	W	12	2009	W	13	2009	W	13	2009
								W	4	2009					W	9	2009	W	10	2009	W	10	2009	W	11	2009	W	12	2009	W	12	2009
	LQOBK.30R3	Q30R3	006	204	N.A.			W	4	2009	N.A.				W	12	2009	W	13	2009	W	13	2009	W	14	2009	W	15	2009	W	15	2009
								W	4	2009					W	9	2009	W	10	2009	W	10	2009	W	11	2009	W	12	2009	W	12	2009
	LBBLA.31R3	A31	2440	3636	N.A.			W	3	2009	N.A.				W	6	2009	W	7	2009	W	7	2009	W	8	2009	W	9	2009	W	9	2009
								W	4	2009					W	7	2009	W	8	2009	W	9	2009	W	10	2009	W	10	2009	W	10	2009
	LBALA.31R3	B31	3413	1072	N.A.			W	---	---	N.A.				W	---	---	W	---	---	W	---	---	W	---	---	W	---	---	W	---	---
								W	done						W	done		W	done		W	done		W	done		W	done		W	done	
	LBBLD.31R3	C31	2429	1231	N.A.			W	4	2009	N.A.				W	11	2009	W	12	2009	W	12	2009	W	14	2009	W	15	2009	W	15	2009
								W	4	2009					W	7	2009	W	8	2009	W	8		W	9	2009	W	10	2009	W	10	2009
	LQOAC.31R3	Q31R3	364	192	W	---	---	W	---	2009	N.A.				W	---	2009	W	---	2009	W	---	2009	W	---	2009	W	---	2009	W	---	2009
					W	done		W	done	2009					W	done	2009	W	13	2009	W	13	2009	W	14	2009	W	15	2009	W	15	2009
	LBALA.32R3	A32	2624	2102	N.A.			W	---	---	N.A.				W	---	---	W	---	---	W	---	---	W	---	---	W	4	2009	W	4	2009
								W	done						W	47	2008	W	49	2008	W	49	2008	W	2	2009	W	4	2009	W	5	2009
	LBBLA.32R3	B32	2252	2194	N.A.			W	---	---	N.A.				W	3	2009	W	4	2009	W	4	2009	W	5	2009	W	6	2009	W	6	2009
								W	done						W	8	2009	W	9	2009	W	9	2009	W	10	2009	W	11	2009	W	11	2009
	LBALB.32R3	C32	2443	2171	N.A.			W	5	2009	N.A.				W	9	2009	W	10	2009	W	10	2009	W	11	2009	W	12	2009	W	12	2009
								W	5	2009					W	10	2009	W	11	2009	W	11	2009	W	12	2009	W	13	2009	W	13	2009
	LQOBA.32R3	Q32R3	279	200	N.A.			W	7	2009	N.A.				W	11	2009	W	12	2009	W	12	2009	W	13	2009	W	14	2009	W	14	2009
								W	11	2009					W	12	2009	W	13	2009	W	13	2009	W	13	2009	W	14	2009	W	14	2009
	LBBLA.33R3	A33	2103	2103	N.A.			N.A.			W	5	2009	W	10	2009	W	12	2009	W	12	2009	W	13	2009	W	14	2009	W	14	2009
											W	6	2009	W	9	2009	W	10	2009	W	10	2009	W	12	2009	W	13	2009	W	13	2009
	LBALA.33R3	B33	2192	2192	N.A.			N.A.			W	7	2009	W	11	2009	W	13	2009	W	13	2009	W	14	2009	W	15	2009	W	15	2009
											W	8	2009	W	11	1009	W	12	2009	W	12	2009	W	15	2009	W	16	2009	W	16	2009
	LBBLD.33R3	C33	2108	2108	N.A.			N.A.			W	7	2009	W	11	2009	W	12	2009	W	12	2009	W	13	2009	W	14	2009	W	14	2009
											W	9	2009	W	12	2009	W	13	2009	W	13	2009	W	14	2009	W	15	2009	W	15	2009
	LQOAK.33R3	Q33R3	227	227	N.A.			N.A.			W	5	2009	W	8	2009	W	9	2009	W	9	2009	W	10	2009	W	11	2009	W	11	2009
											W	8	2009	W	10	2009	W	11	2009	W	11	2009	W	12	2009	W	13	2009	W	13	2009
1-2	LBBRA.16R1	B16	2432	2334	N.A.			W	---	---	N.A.				W	4	2009	W	5	2009	W	5	2009	W	6	2009	W	7	2009	W	7	2009
								W	50	2008					W	4	2009	W	5	2009	W	5	2009	W	6	2009	W	7	2009	W	7	2009
6-7	LBBRA.32R6	B32	2441	2303	N.A.			W	6	2009	W	7	2009	W	10	2009	W	11	2009	W	11	2009	W	12	2009	W	13	2009	W	13	2009
								W	6	2009	W	7	2009	W	10	2009	W	11	2009	W	11	2009	W	11	2009	W	12	2009	W	12	2009

What we did specifically for S.3-4 reparation and in general to improve QA?

Assessing magnet damages

- Cryostated magnets removed and substituted when:
  - Electrically damaged
  - Mechanically damaged,
  - Bus-bar system damaged due to displacements
  - Internal dirtiness

- Cold Mass removed and eventually re-used:
  - No electric damage or soot inside the cold mass;
  - No displacement at rest: we estimate from models that at max the displacement for such CM was < 50 mm well within the max elongation of the lyra (180 mm). For Q22 the displacement at rest is about 20 mm. We believe that it is safe.
  - No visual damage from endoscopy (except minor scratch on bus bar that are similar to other already seen in magnet later installed).
  - Qualification by COLD TEST

Qualification of magnets inside tunnel

- The magnets re-used qualify, if they are found good, the magnet "behind" them.
- The 4 magnets in the affected-zone that we don't remove and the rest of the magnets in the Sector are then qualified by this procedure.

Examples of reparations acceptable on the re-used cold mass and cryo-magnets:

- MLI substitution (in one case for MB, in several cases for the SSS)
- Change of extremities flanges for Services and Beam Lines
- Cold feet substitution (ONLY for some SSS)
- Prolongation of spool busbars by US welding technique (configuration of spool BB is longer for Cold Test that for Tunnel)

Major actions taken at the level of COLD TESTS (at SM18):

- A new Test Step: "**MAIN SPLICES Check"** was added systematically on both DIPOLES and SSS . After several weeks of optimization (and problem!) of the tooling and procedure these are now finalized and from week7 the check is done ON-LINE with the powering test. Backlog was recovered (*the blocked 3383 was intercepted there*).
- Another new Test Step: "**SPOOL SPLICES Check"** was added systematically on both DIPOLES and SSS. The check is done OFF-LINE and is not straightforward due to the measurement precision, to the high number of splices in place in the cold test configuration of the magnets and to the "weakness" of some voltage taps configuration on the test benches. Anyway it will intercept all insulation problems and major high resistance problem too.
- An HV test on spool correctors was added.
- All Magnets are now systematically tested to ULTIMATE current.

Major actions taken at Preparation for the Tunnel Phase (at SMI2):

- Doubling the Step: **"Final inspection of the extremities"** at beginning of activities of SMI2; this is actually intercepting the majority of NC on Flanges, BB and BB support NCs.
- A new Step **"Diode Check"** was added taking also in account the high number of diodes to be installed or changed of polarity.
- A new Step **"Final Electrical Test"** was added for the DIPOLES (it was already present for the SSS).
- (Obvious) "extra-sensibility" for anything that can impact the quality of magnet interconnections for main and spool BB (cables status, Cu stabilizers, "spiders", geometry, quality of the US prolongations, etc. These aspects, as a NC arise, are commented and discussed with the Tunnel Interconnection and Magnet Reparation Teams.

NOTE: *A lot of actions were taken at the level of the MTF the (Manufacturing Data Base of CERN) to follow coherently the new activities (ex. RE-TREATMENT of magnets arriving from the Tunnel, new Checks or Inspection&Tests, installation of the relief valves, etc.)*

How many SPARES magnets will remain at the completion of the reparation?

Reminding that in LHC we have:

- **2** dipoles c.m. types (for **1232** units of LHC dipoles)
- **40** c.m. types (for **360** units of Arc-SSS)
- **20** c.m. types (for **64** units of DS-SSS)
- **27** c.m. types (for **50** units of DS-SSS)

Status	Quantity	SSS & MB Identity
MB cold mass spare still available	*6*	*Type A= 2437- **2438** -2445-2524* *Type B= **2431-2442***
SSS cold mass	1	SSS279
MB at cryostating or preparation for cold test	1	3383
SSS at cryostating or preparation for cold test	1	SSS219
MB at cold test	8	1071-1092-1099-2035-2108-2192-2441-2433
SSS at cold test	1	SSS208
MB at Stripping and Fiducialization	9	2427-2428-2443-2446-2690-1085-(2103-2868)-3118
SSS at Stripping and Fiducialization	5	SSS006-SSS364-SSS195-SSS225-SSS227
MB at SMI2 (beam sceen & BPM)	3	2418-2435-2444
SSS at SMI2 (beam sceen & BPM)	2	SSS203-SSS221
MB at Storage before installation	0	
SSS at Storage before installation	0	
MB at preparation for tunnel	4	2252-2421-2429-2440
SSS at preparation for tunnel	1	SSS369
MB Installed	16	1219-2342-2739-2399-2419-2422-2430-2432-2434-2436-2439-2551-2598-2624-2790-3413
SSS Installed	3	SSS055-SSS243-SSS277

RED : Magnet blocked

GREEN : Magnet arriving from S.3-4 (to be RE-INSTALLED)

MB2432 = for sector 1-2 / MB2441 = for sector 6-7

MB spares (total)	41	/41
SSS spares (total)	14	/14

A. Russo 3-4 General Status Table 3/4/2009

+ dipole 1011 (magnet cryostated and tested) reserved for S.7-8 (Coil Cross Section 1; Type A)

SSS or c.m. IDENTITY	c.m.TYPE, population in LHC	MQ ext./int.	Sextupole/ dipole corr.	Corrector magnet	Diode type	SSS TYPE	Cryostat Items or STATUS
SSS064	LQMOF,27	D/F	MSCBB	MO	B	LQOAH	SSS cryostated. In test configuration.
c.m. 005	LQMOG,3	D/F	MSCBD	MO	A	LQOAJ	- Standard inertia tube - Studs (x4) - Line X short
c.m. 006	LQMOU,9	F/D	MSCBC	MO	B	LQOBF, LQOBD	To be confirmed after cold test.
c.m. 055	LQMTF,30	D/F	MSCBB	MQT	B	LQATI	- Standard inertia tube - No studs - Line X short
c.m. 072	LQMTF,30	D/F	MSCBB	MQT	B	LQATI	- Standard inertia tube - No studs - Line X short
c.m. 243	LQMTE,30	D/F	MSCBB	MQT	A	LQATH	- VB inertia tube - No studs - Line X long
c.m. 277	LQMOR,9	F/D	MSCBA	MO	B	LQOBB	- Standard inertia tube - No studs - Line X short
c.m. 279	LQMSD,12	F/D	MSCBA	MQS	B	LQASE, LQASF	- VB inertia tube - PLUGS - NO Xline
c.m. 344	LQMOU,9	F/D	MSCBC	MO	B	LQOBF, LQOBD	- Standard inertia tube - Studs (x2) - Line X short
c.m. 364	LQMOF, 27	D/F	MSCBB	MO	B	LQOAH	- VB inertia tube - Studs (x4) - Line X long
c.m. 367	LQMTE,30	D/F	MSCBB	MQT	A	LQATH	- VB inertia tube - Studs (x4) - Line X long
c.m. 369	LQMTH,18	F/D	MSCBA	MQT	B	LQATK, LQATM, LQATU	- VB inertia tube - Studs (x4) - Line X short
c.m. 372	LQMOA,2	D/F	MSCBB	MO	A	LQOAB	- VB inertia tube - Studs (x4) - Line X short
c.m. 080	LQMTG,18	F/D	MSCBA	MQT	A	LQATJ, LQATL, LQATV	*Under investigation for Leak*
SSS523	LMQTC,6	F/D	MSCBA	MQTL	A	LQTCC	*For DS SSS Only*

SMI2 Team is now able to change any configuration at cryostat/VB/plugs level;

CHANGE the BB polarity and Correctors layout INSIDE the c.m is not yet possible (see forward)

How many magnets will need reparation?
And which type of reparation?

- Group A: Dipoles with weak internal splices (2 from LHC, 1 from Spares); “easily” reparable.

- Group B: magnets without direct electrical damage, and no measured displacement (9 units)

Decryostating without displacement			
DIPOLE		ARRIVAL	STATUS
A26	1242	11/28/2008	Decryostated
B26	2111	11/24/2008	Decryostated
C26	2100	11/27/2008	Decryostated
A30	1154	12/17/2008	Decryostated
B30	3409	12/15/2008	Decryostated
C30	1083	12/2/2008	Decryostated
C29	2040	12/12/2008	Decryostated
B25	1084	12/5/2008	Decryostated
C25	3096	11/25/2008	Decryostated

All de-cryostated to re-use components for cryostating new CMs.

Order of intervention: starting from the dipoles showing less probability to have electrical problem

- Group C: Dipoles without electrical damage, but displaced (11 units)

GROUP C			
Decryostating with displacement / cold mass apparently not damage			
DIPOLE		**ARRIVAL**	**STATUS**
A23	1236	11/19/2008	
A29	1112	12/3/2008	
B29	1061	12/16/2008	On going
A31	3636	12/18/2008	Decryostated
A27	2043	12/19/2008	
B31	1072	12/8/2008	
B23	2193	11/20/2008	
B27	1089	11/28/2008	
A32	2102	12/10/2008	
C31	1232	12/3/2008	
C28	3103	12/10/2008	

Order of intervention:

from less displaced to more displaced, taking into account that a compression on lyras is less dangerous then a similar actions on CS side

- Group D: magnets with direct electrical damage (10 units)

GROUP D			
Decryostating with displacement / cold mass apparently damage			
DIPOLE		ARRIVAL	STATUS
C32	2171	1/6/2009	
B28	3128	1/7/2009	
A25	1132	12/4/2008	Decryostated
B24	2055	1/6/2009	
B32	2194	1/8/2009	
C27	1235	12/2/2008	
C24	3110	1/8/2009	
C23	1109	11/21/2008	
A28	1088	12/11/2008	
A24	1241	12/11/2008	

Order of intervention from probably less damaged to more damaged.

- 1“old” sick magnet (1055 with suspicious of a potential short inter-turn) from Series Production Phase (but it need extra investigation)

For SSS

- The tower for vertical assembly and disassembly is being installed at CERN; Ready at end of March.
- We need to practice with the “vertical technology” that was never used at CERN before and due to the lack of spares components we need to recover pieces during disassembly.
- Reparation will be longer and more complex than for dipoles
- Bus bars availability is a critical items (need workshop)
- For the MS-SSS, they were all assembled at CERN in a “dipole-like” way and technology is well known.

Thanks for the attention

- Compare to Main Dipoles, SSS are less (474 versus 1232) but they are more complicate objects at both levels of c.m. and cryostating:

- They are subdivided in 3 big families looking at their location in the machine:

1. **"Arc SSS": 360** units (40 c.m. types and 10 cryostat types assembled in **61** different types of Arc SSS)

2. **"Dispersion Suppressor SSS"** (DS-SSS): **64** units (20 c.m. types and 16 cryostat types assembled in **34** different types of DS-SSS)

3. **"Matching Section SSS"** (MS-SSS): **50** units (27 c.m. types and 33 cryostat types assembled in **41** different types of MS-SSS)

ARC-SSS

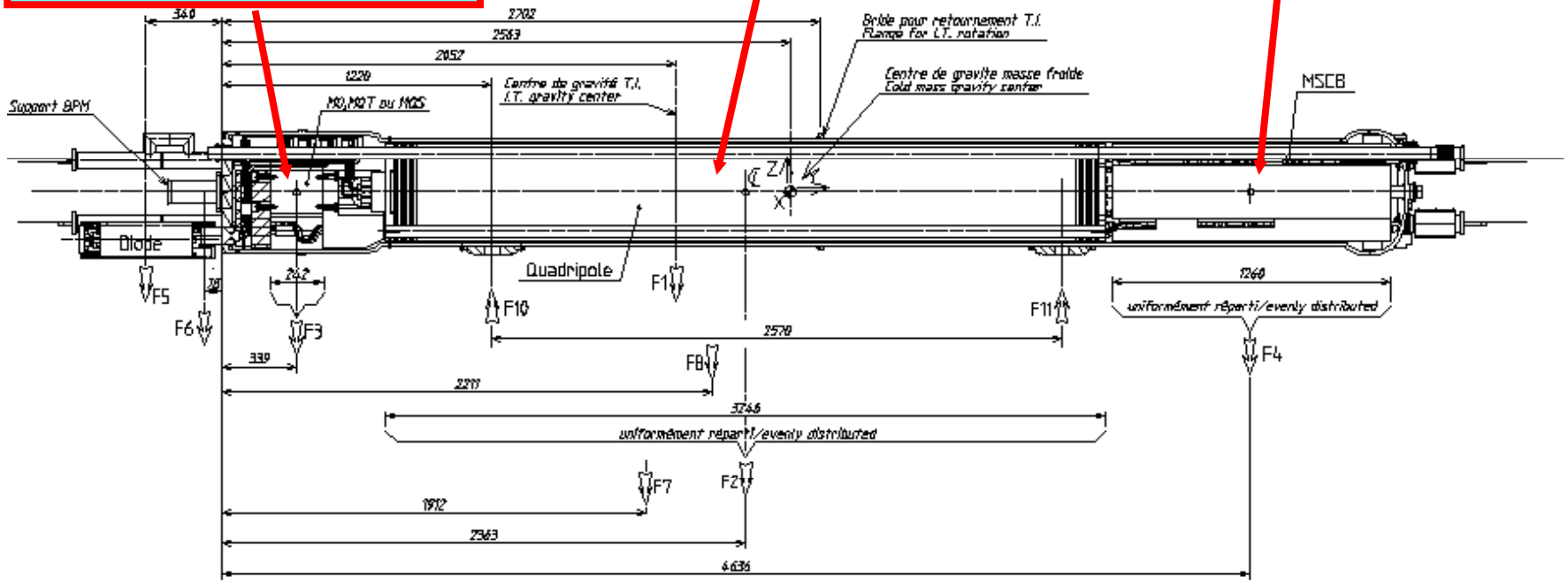
MO: Octupole

MQT: Tuning quadrupole

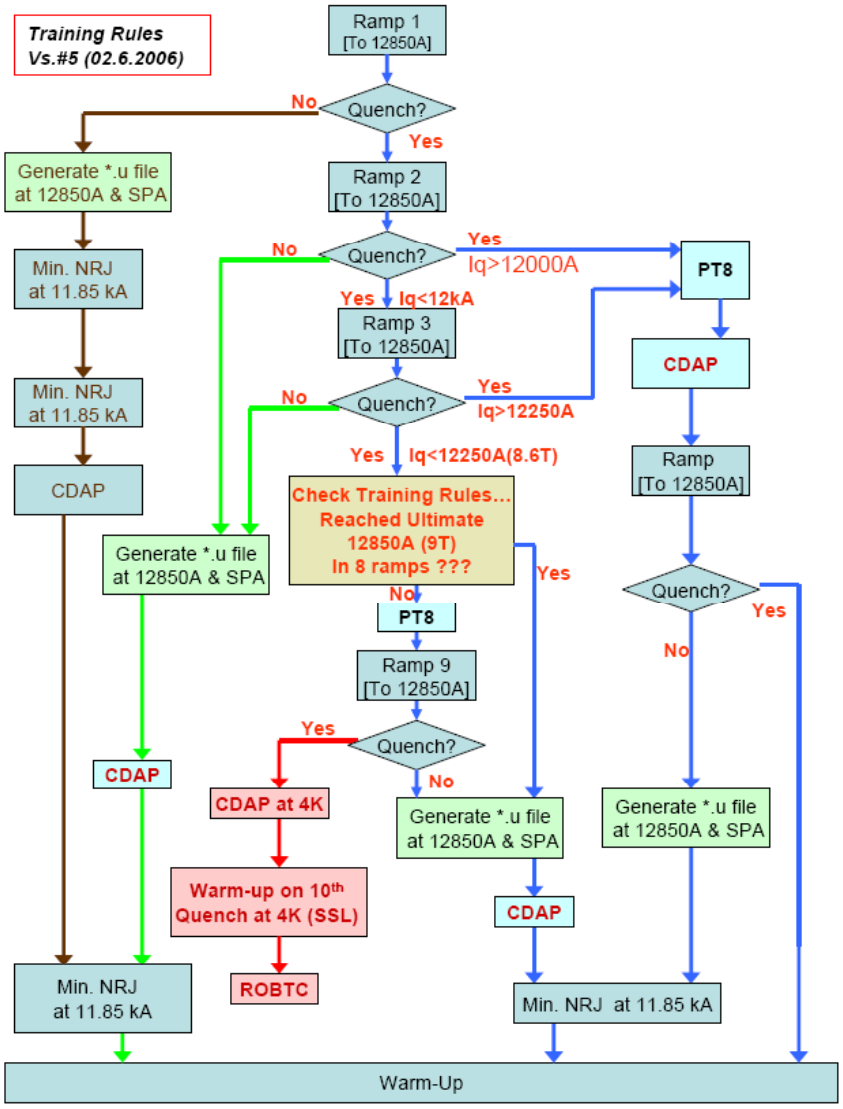
MQS: Skew quadrupole

MQ (F,D): Main quadrupole

MSCB (A,B,C,D): Sextupole-dipole corrector



For example: The missing c.m. type (LQMSA/LQMSB) is composed by MQS + MQ + MSCBB + D/F busbars



TRAINING Rules:

Max 9 Ramps to 12850A (9.0 Tesla) in the First Run;

Magnet is considered "TRAINED", If :--

(a) Iq > 12000 A (8.4 T) after Second Quench, OR

(b) Iq > 12250 A (8.6 T) after Third Quench, OR

(c) Current Reaches Ultimate value of 12,850 A (9.0 T) during or after second training.

If ANY of above Three Conditions are met, STOP Further Training. Magnet is ACCEPTED…Follow Flow-Chart for Final Tests before Warm-up.

Else: Magnet is POOR & do warm-up on 10th Ramp (4K SSL quench for Dipoles; while in case of SSS, warm-up with PT10.1)…Prepare for Thermal Cycle.

THERMAL CYCLE Rules:

If the Magnet NOT Accepted in First Run, Then Go for a Second Run After "Rapid On-Bench Thermal Cycle" (With or Without AntiCryostats, whatever the case in First Run) with Following Rules:

Only TWO Training Quenches Always.

If Iq(1) > Iq(1) of Previous Run,
AND

Iq(2) > 12000A (8.4T), Then Magnet OK and Accepted.

Second Quench can be used as Warm-Up Quench, if PT8 and PT9(CDAP) are done between these Two Quenches, otherwise do them after Second Quench, and do PT10 (Min.NRG @11850A) for warm-up.

If Magnet NOT Accepted in Second Run (Rapid On-Bench Thermal Cycle), Go for a Third Run WITH Anticryostats and Loc.Quench Antenna After Another Thermal Cycle (In consultation with Experts)

Perform Max. 5 Quenches in Third Run

MM Rules* (If Shafts Are Present!)

- Shafts to be Inserted AND Removed below 80 K
- MM to be done AFTER Quench Current reaches 12 kA
- MM2: LHC Cycle to be Preceded by a Quench (Iq = 6500 A min.)

DE-TRAINING Rules:

In case of De-Training (Iq < Previous Iq) at any Stage,

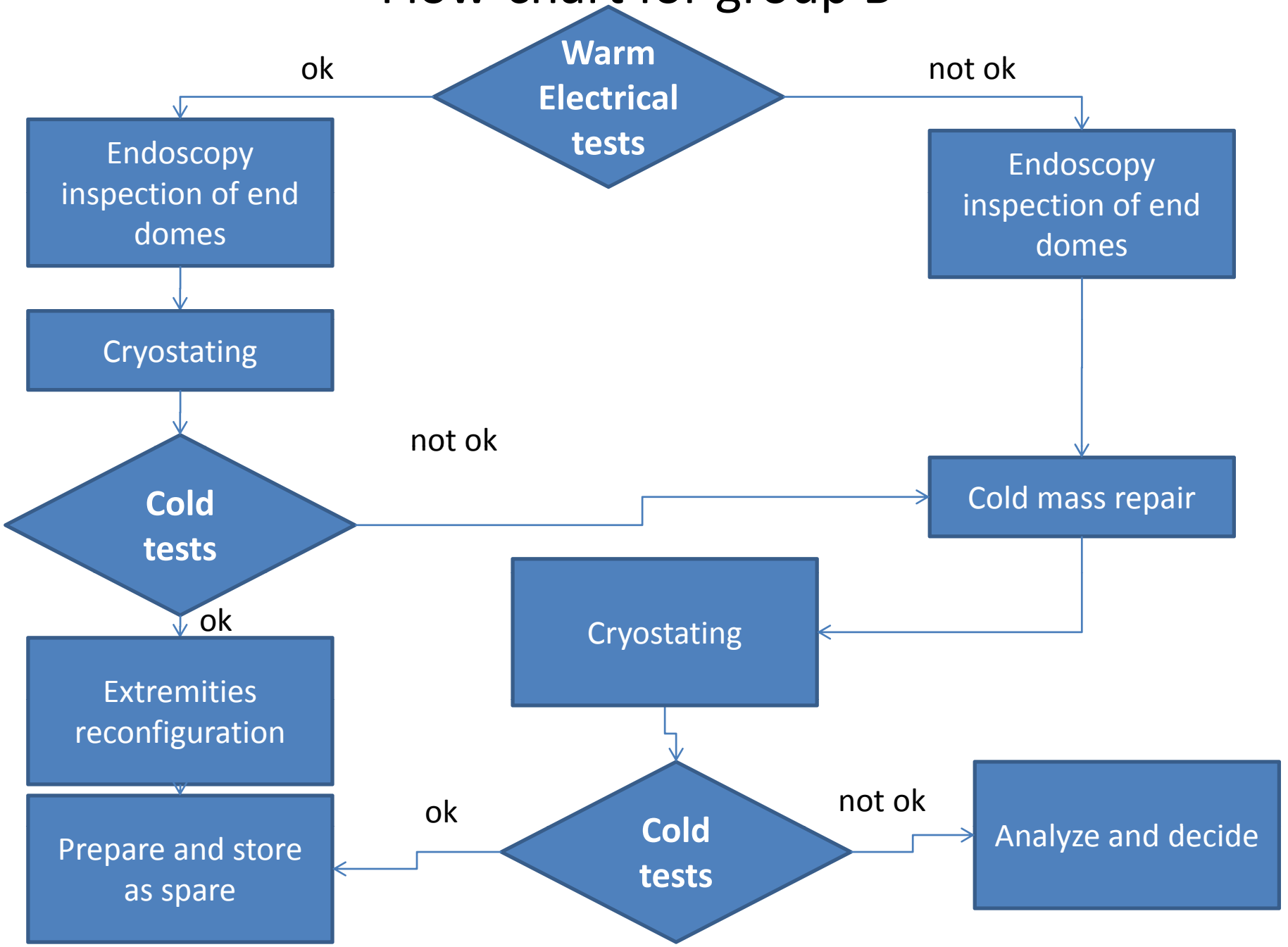
If De-Trained Quench Current Iq > 12kA (8.4T), Continue as Per Flow-Chart, as Magnet quench current was still ABOVE Nominal Acceptance Limit of 12kA (8.4 T).

Else – If Iq < 12kA, Continue Training Further as per Training Rules UNTIL Magnet reaches Ultimate 12850 A (9 T)

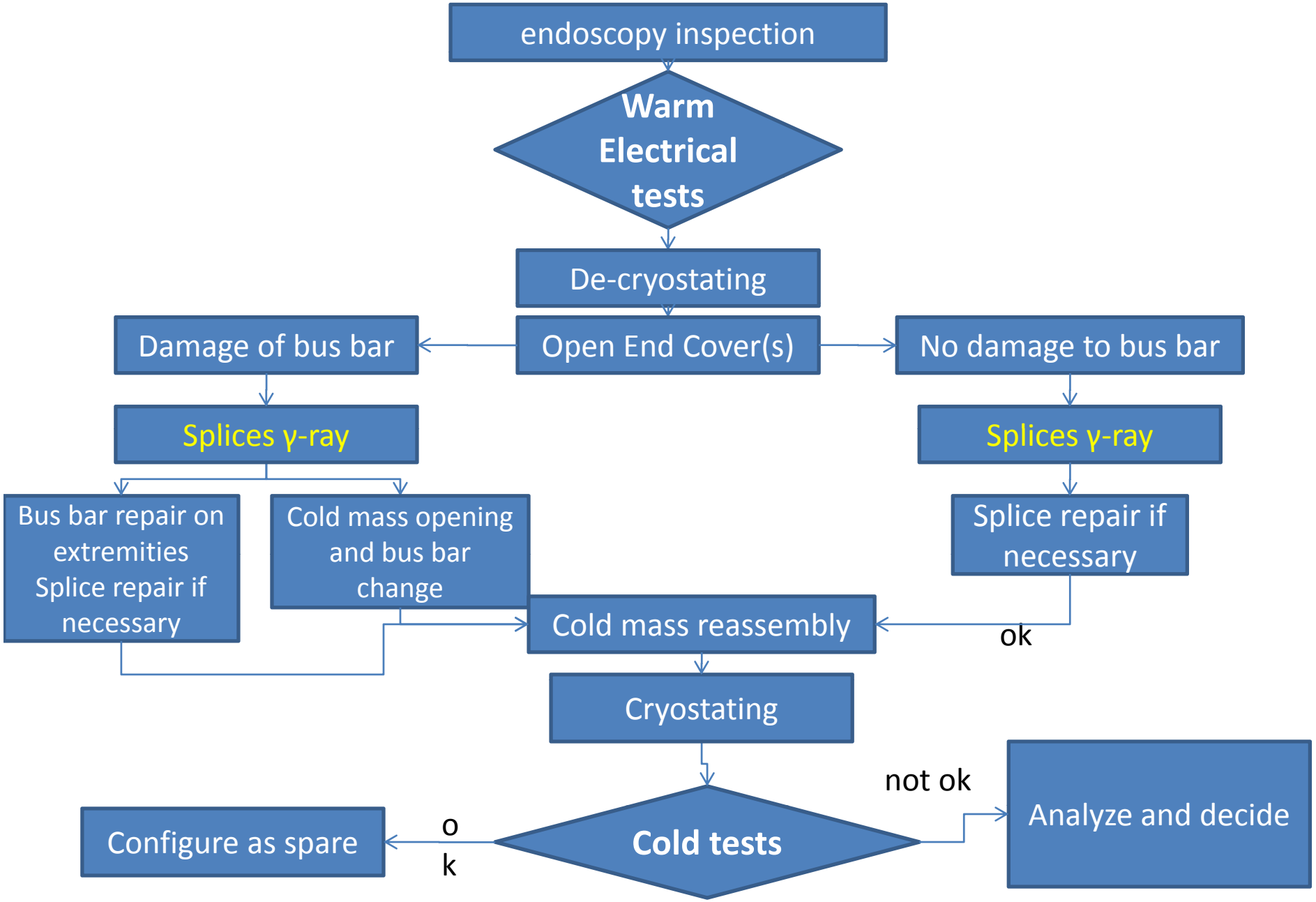
Plan for MB repair

Starting date	End date	Units/week	Magnet Group	Cumulative of repaired spare
Oct 2008	April 2009	2	New CM prepar.	(30)
May 2009	July 2009	Magnet facilities and tooling	==	==
		Reparation external splice		? (2 minimum)
September 2009	End November 2010	1	Group B	9
December 2009	Mid June 2010	0.5	Group C	20
June 2010	End of August 2010	0.5	Gr. D easy	*23*
September 2010	**December 2010**	**1/month**	**Gr. D medium**	***27***
January 2011	End 2011		Gr. D - Rebuilt	30

Flow-chart for group B



Flow-chart for group C



Flow-chart for group C