

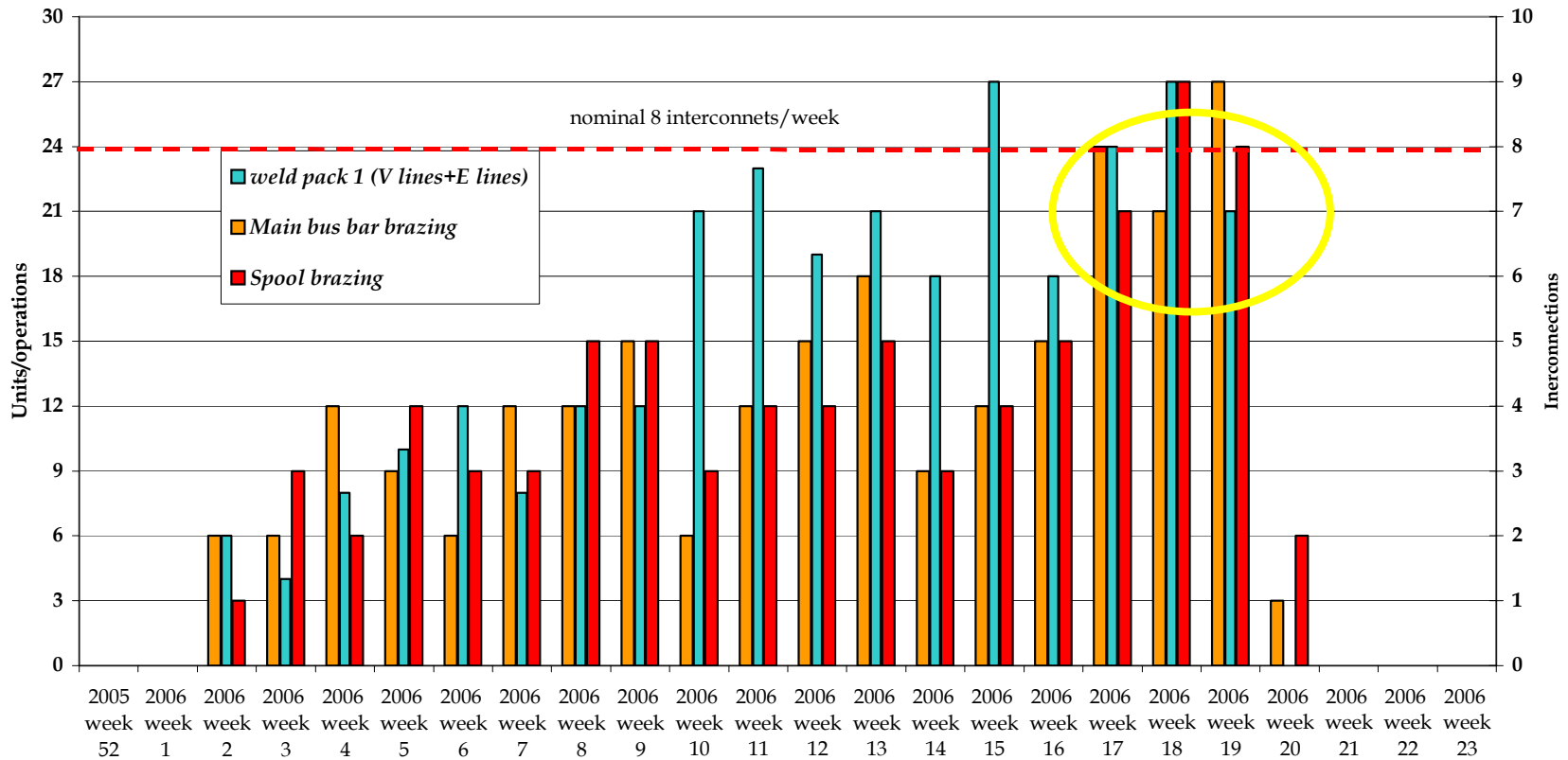
Progress Status of LHC Interconnections

F. Bertinelli / AT-CRI (20 minutes)

- Progress since TCC 7 April 2006
 - “7-8 & 1-8 best scenario”, effect of new actions
- ... beyond 7-8 & 8-1
- Help needed

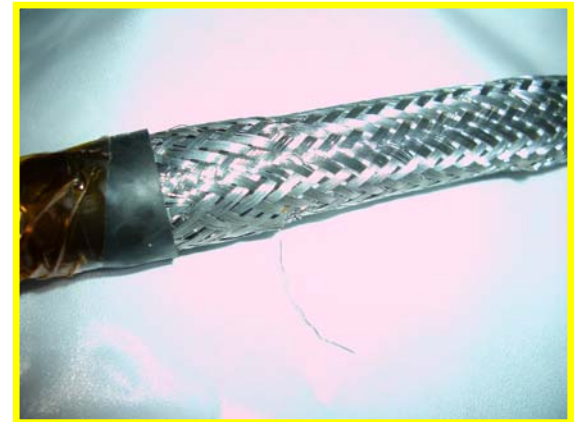
Production rate 4-5

from P. Fessia

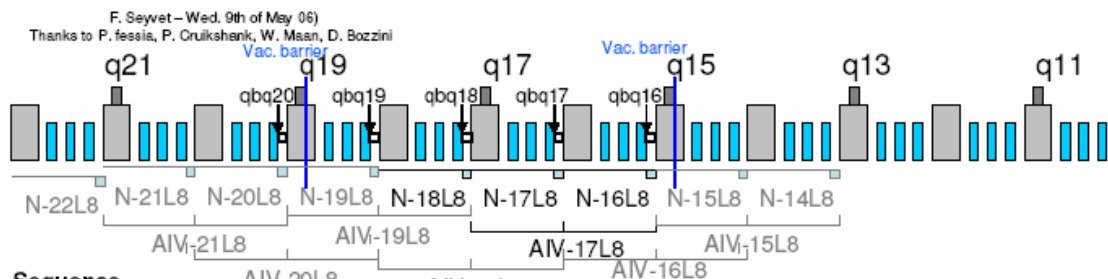


- e.g. weld V&E: 10 activities > 60 welds, i.e. 15 welds / day (1 welder or 1 welder + 1 tacker).
Pure weld time: 3.5 min (+ mounting pieces + positioning + dry run).

- M1, M2 and M3 welds
- K1 and K2 welds
- Line N:
 - insertion: observed damaged wires to metal braid, corrective insulation action, updated procedure, ordered additional support arms
 - HV tests
 - cabling
 - AIV1
 - US weld spool wires
 - AIV2
 - weld of first N flanges (yesterday!)
- Jumpers:
 - observed out-of-tolerance tube dimensions, ordered modified insertion pieces
 - weld of first CY flanges (yesterday!)
- Completing assembly of 2 cells for early vacuum testing
- C' flanges: quality and productivity improved, ordered modification to connecting tube dimensions



Sequence to first global leak test Sector 78 interconnections






Sequence

1. (x4) PAQ test 19-20-21-22L8
2. (x4) connect bb and spools qbq19-20-21-22L8
3. Finish connecting bb and spools in 13-14-15L8
4. (x6) insert and cable line N's 14-15-19-20-21-22L8
5. (x2+1) AIV 15-16-17L8 => weld M,N,K12 in qbq16
6. (x4) AIV18-19-20-21L8 => weld M,N,K12 in qbq17-18-19-20 (seq.)
7. (x12) weld N,K12 in 16-17-18-19L8
8. (x8) weld M in 16-17-18-19L8
9. VAC test V1-V2-E on 16-17-18-19L8:
(x2) repairs + (x1) new weld
10. VAC leak test line X incl. jumper
 - no VAC test X required (q15-17-19L8 done)
 - (x3) weld CY in jumper q15-17-19L8
 - pump from XB in SSS jumper, CY valve closed in QRL jumper, Spray He on CY, detect leaks
 - (x3) weld XB, use clamshells to pump and detect: He in QRL jumper XB line (w. plug)
11. VAC leak test line KC' incl. jumper
 - (x6) weld KD1,2 in jumper q15-17-19L8
 - Pump from CC' in SSS jumper, KD valve closed in QRL jumpers, spray He on KD, detect leaks
 - (x3) weld CC', use clamshells to pump and detect: He in QRL jumper CC' (w. plug)
12. (x4) weld LD1,2 in jumper q15-17-19L8
NOT LD2 IN Q19
13. Pump and backfill CM with He, clamshells LD welds in q15-17-19 (QRL jumper valve closed)
14. (x2) Weld jumper bellow q15-17L8
15. (x16) close IC (bellows) without MLI
16. Pump insulation vac from SSS cryostat, pump CM from LD2 in jumper q19. Monitor He residual and leak test external envelope
17. From LD2 backfill CM with he, global leak test CM circuitry (N, M lines)

from F. Seyvet

- links (and lags) between activities
- amplification effect from missing SSS

Transfer of 4-5 resources to 7-8

- transfer started 15 May 2006, to 7-8 SS E to I
- in 4-5 now ending all VAC and MEL tests
- then inspect all interconnections with work-in-progress with IEG and move W bellows in position by IEG
- In future: 1 responsible engineer for 3-4 & 4-5, 1 deputy (to be defined) 
(the previously expected person was shifted to more urgent DFB work)
- Now: need support to follow jumper cutting in 3-4 (work for deputy) 
- Still undefined: responsibility over protection (and regular check) of new magnets installed 

Increase of welding resources

- IEG request to “Inspection de Travail” for 2nd shift was refused
 - requires a coordinated CERN approach
 - requires an active CERN responsible person 
- Working time 6h to 21h, Monday to Saturday does not require permit
 - Additional welding team starting next week, Wednesday to Saturday (6h, 10h, 10h, 10h)
 - Possibly modify original team working time (Monday to Thursday, 10h, 10h, 10h, 6h)
 - sharing of tooling, but only 1 exchange per week (better!)
 - effect on coactivity with transport 
- CERN action with “Inspection de Travail” should aim to:
 - open up possibility for regular use of working time 21h to 6h, Monday to Saturday
 - a 12h working day (over 3 consecutive days)? My preferred scenario (and for the moment would keep nights as a reserve capacity)

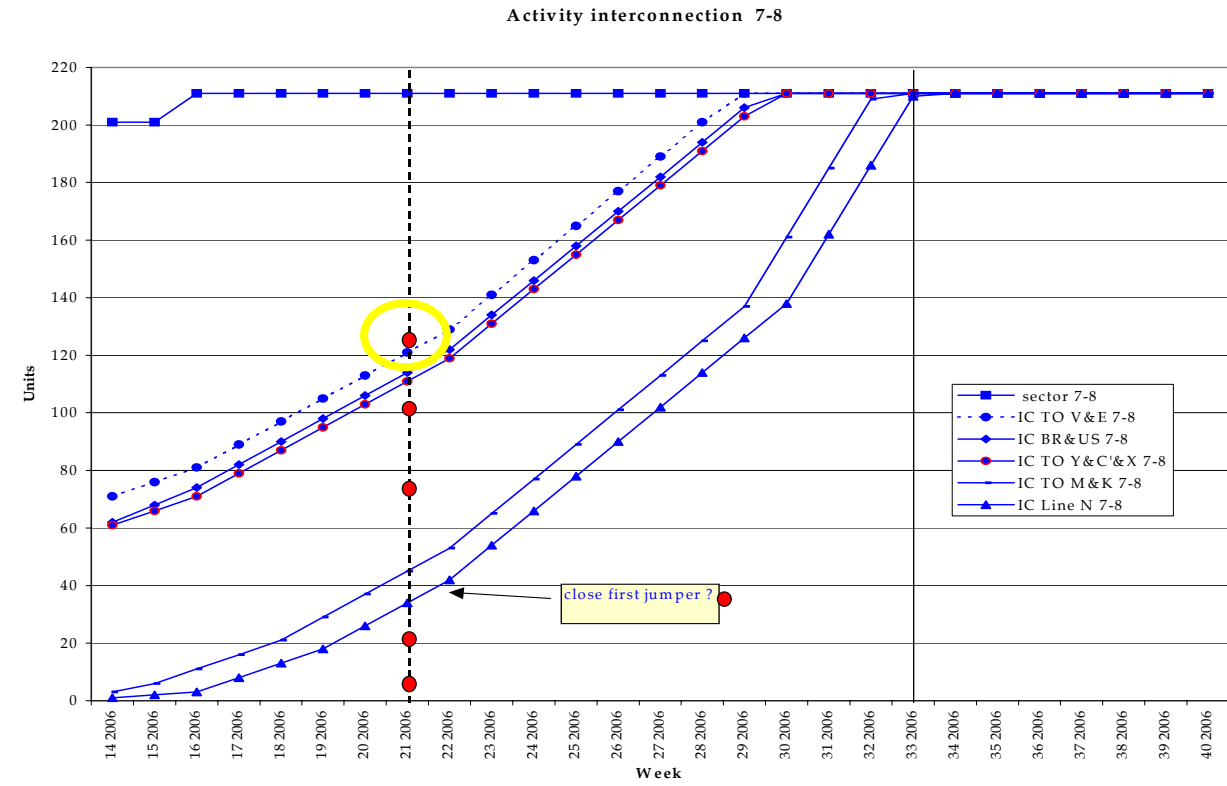
7-8 progress in last 6 weeks

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Microsoft Excel - Copie IEG Sector 78-followup-2006-05-23

K15 = 5/22/2006

	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	IC number	mag. RIGHT	Weld V1 V2	VAC test V1 V2	Weld E	VAC test E	Solder Main BB															
192	QBBI.A13L8	3029	2/21/2004	2/21/2004	2/21/2004	2/21/2004	2/21/2004															
193	QBBI.13L8	0043	12/14/2005	2/19/2005	12/14/2005	2/19/2005	12/15/2005															
194	QBBI.12L8	1017	12/13/2005	2/19/2005	1/19/2005	2/13/2005	12/15/2005															
195	QBBI.B12L8	1133	1/24/2005	2/19/2005	1/19/2005	2/12/2005	1/19/2005															
196	QBBI.A12L8	3034	1/12/2005	2/18/2005	12/17/2005	2/12/2005	1/13/2005															
197	QBBI.12L8																					
198	QBBI.11L8	0001																				
199	QBBI.11L8	3066																				
200	QBBI.11L8	3264	1/12/2005	5/13/2005	12/15/2005	5/15/2005	12/11/2005															
201	QBBI.11L8	0602	4/4/2004	5/13/2005	4/4/2004	5/15/2005																
202	QBBI.10L8	3053	4/4/2004	5/13/2005	4/4/2004	5/15/2005	4/5/2004															
203	QBBI.10L8	1030	3/30/2004	5/13/2005	3/30/2004	5/15/2005	4/7/2004															
204	QBBI.10L8	0613	4/4/2004	5/13/2005	4/4/2004	5/15/2005																
205	QBBI.3L8	3062	4/3/2004	5/13/2005	4/3/2004	5/15/2005	4/5/2004															
206	QBBI.3L8	3036	4/3/2004	5/13/2005	4/3/2004	5/15/2005	4/4/2004															
207	QBBI.3L8	0601	3/30/2004	5/13/2005	4/3/2004	5/15/2005	4/3/2004															
208	QBBI.8L8	3051	4/3/2004	5/13/2005	4/3/2004	5/15/2005	4/4/2004															
209	QBBI.8L8	3016																				
210	QBBI.8L8	0604																				
211	QBBI.7L8																					
212																						
213	154	123	37	112	69	106																
214																						
215																						
216																						



• Now: need support to consolidate and update “fichier suivi”



7-8 coming weeks ...

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Microsoft Excel - Scenario IC 7 ffb

File Edit View Insert Format Tools Data Window Help

A1 = TRANSPORT

	A	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU
1		Interconnections 7-8															
2	week	IC/week BR&US&insu late(M1&M2 &M3@75%) 7-8 1st wave	PAQ/week 7-8	IC/week BR&US(M1&M2&M3@25%) 7-8 2nd wave	IC/week TO (postes A&B) V&E 7-8	IC/week TO (postes A&B weekend) (M1&M2@75%)7-8	IC/week TO (postes A&B weekend) (M3@100%) 7-8	IC/week TO (postes C) K 7-8	IC/week TO (postes D&E) X&C' 7-8	Line N/week Insertion &cabling AIV17-8	Line N/week US 7-8 2nd wave	Line N/week AIV2 7-8	Line N/week insulation&TO (postes D&E weekend)(M1&M2@25% + NJ) 7-8	Jumpers/sh eek TO (postes C&D weekend) 7-8	IC TO V&E 7-8	IC BR&US M 7-8	IC Line N7 8
3	total	158	53	53	211	158	211	211	211	53	53	53	53	27			
11	18 2006																
12	19 2006														105	91	3
13	20 2006	6	4		8	3	3	3	8	3					113	97	7
14	21 2006	6	4	4	8	3	3	3	8	3	3			1	121	107	15
15	22 2006	12	5	4	16	5	6	6	16	3	3	3		1	137	123	27
16	23 2006	10	5	5	16	5	6	6	16	4	3	3	3	1	153	138	40
17	24 2006	10	6	5	16	8	10	10	16	4	4	3	3	1	169	153	55
18	25 2006	10	6	6	16	12	16	16	16	4	4	4	3	2	185	169	71
19	26 2006	10	6	6	16	12	16	16	16	5	4	4	4	2	201	185	88
20	27 2006	8	6	6	16	16	21	21	16	5	5	4	4	2	211	199	107
21	28 2006		6	6		16	21	21	16	5	5	5	4	2	211	205	127
22	29 2006			6		16	21	21	13	5	5	5	5	2	211	211	147
23	30 2006					16	21	21		5	5	5	5	2	211	211	167
24	31 2006					16	21	21		5	5	5	5	2	211	211	187
25	32 2006					16	21	21		6	5	5	5	2	211	211	202
26	33 2006					3	12	12			7	5	5	2	211	211	211
27	34 2006							6				7	7	2	211	211	211
28	35 2006													3	211	211	211
29	36 2006														211	211	211
30	37 2006																211

Base data / Status / Graph total transport / Graph total IC / Graph team 7-8 / Sheet1 /

Ready NUM

11:06 PM

- 2x BR (7-8 &4-5)
- 2x US (7-8 &4-5)
- needed: 1x US 
- 2x TO V&E (7-8 &4-5)
- 2x TO X&C' (7-8 &4-5)
- starting: 1xM & 1xK
- needed: 1xM 

Comments from 7-8 experience ...

- Time lag end installation – alignment - ICIT pre-inspection: ~ 3 weeks
- Schedule is extremely aggressive:

- F. Seyvet, P. Fessia, A. Jacquemod strongly involved daily

- Additional responsibilities, tasks (and risks!) taken up by CRI in order to progress: this view is not shared by everyone in CRI

- no contingency for technical problems (e.g. V1/V2 leaks...)

- still aiming end line N and jumpers for week 33 (35) for 7-8

- Need to boost activity in 8-1 within a few weeks, additional IEG staff

- Use next weeks in 7-8 to test BR&US before V1/V2

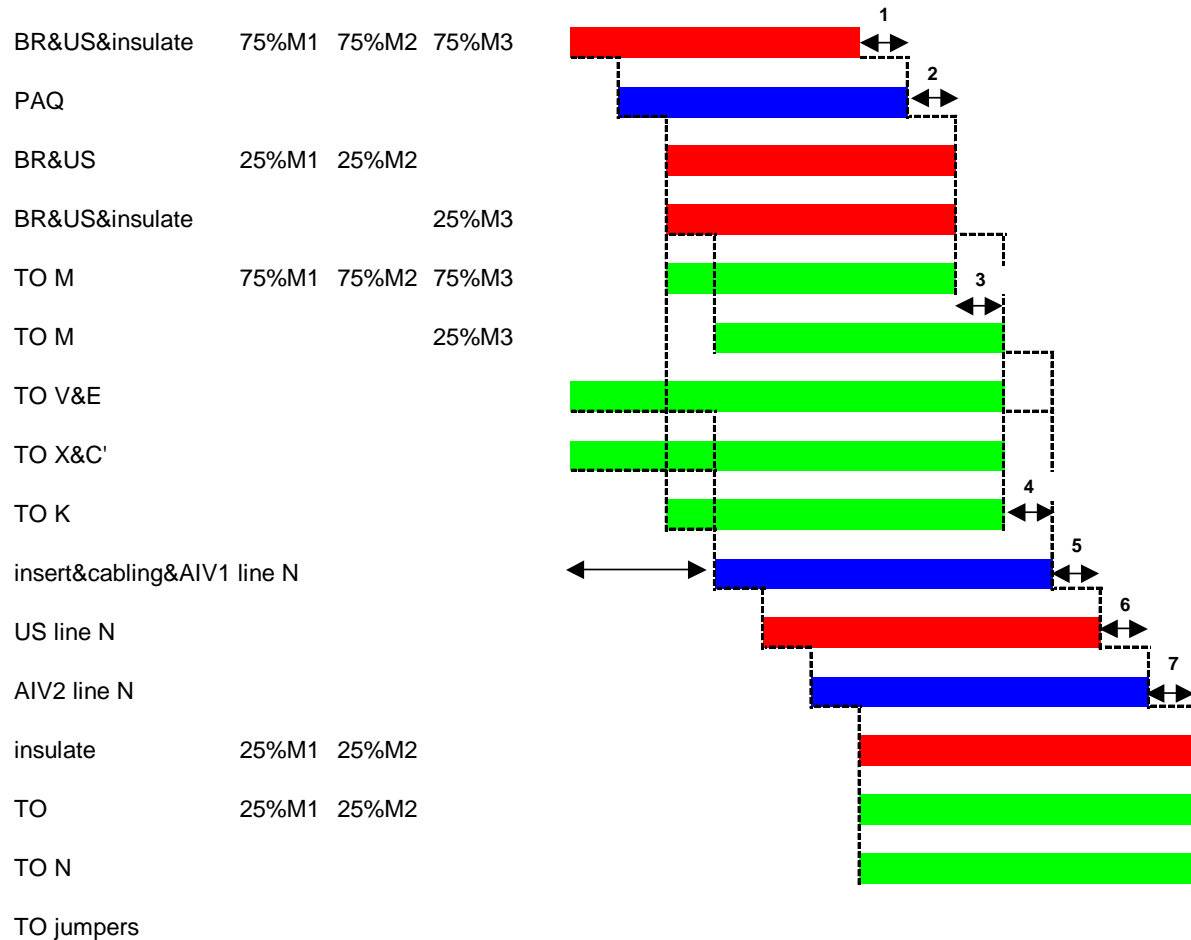
- Continue actions to reduce number of open NC associated to magnets before being lowered (ICIT Inspection in SMI2)

- Continue actions for direct resolution of NC at pre-inspection

- Need more CERN resources to implement the Quality Control (e.g. welding samples in production, follow-up of recorded parameters, ...)

- Need more CERN resources to share the workload: ad-hoc project possibilities exist (e.g. implement the endoscope/camera, repair of V1/V2 leaks, ...)

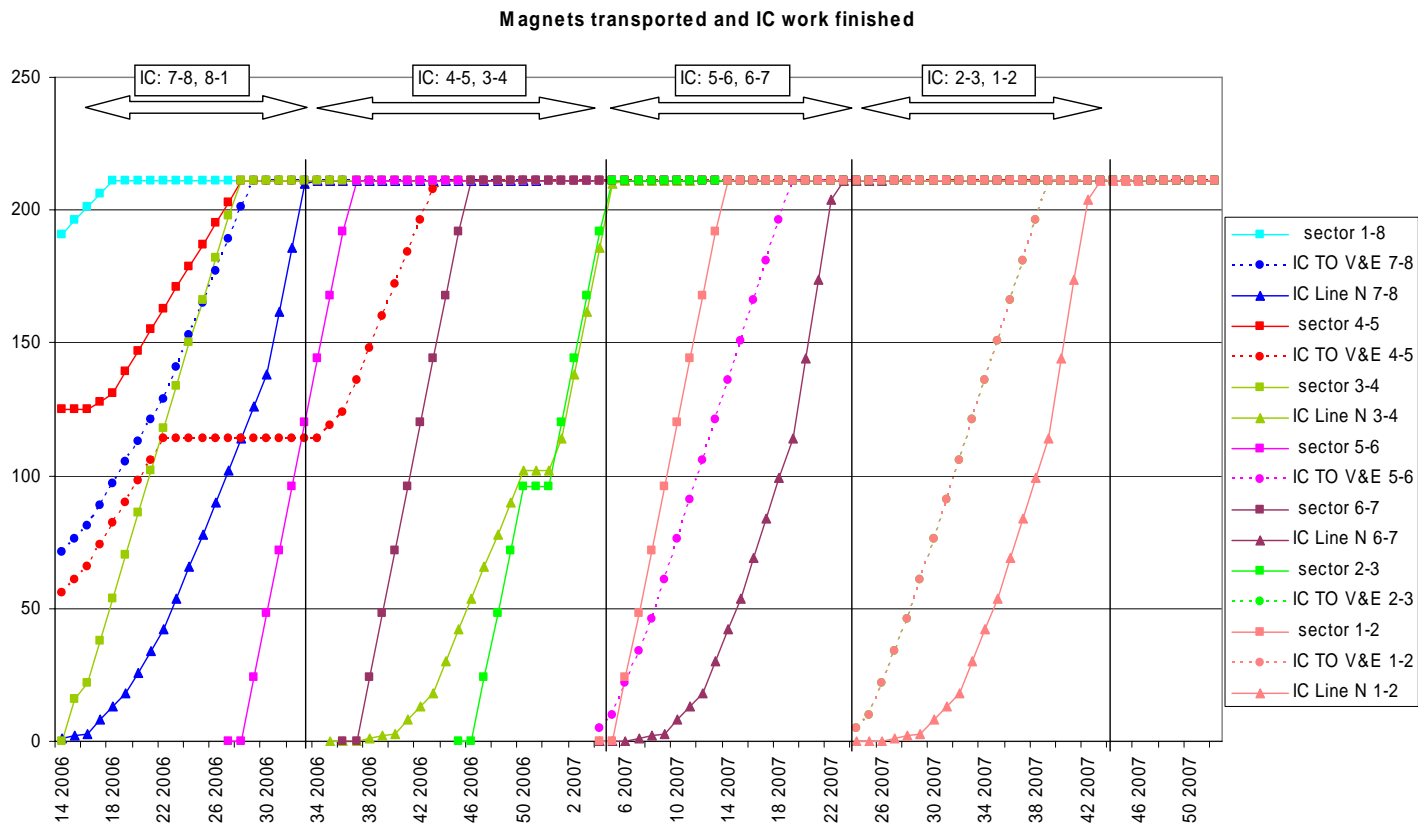




- The sequence of activities alone implies minimum 7 lag weeks.
- Upon starting an activity (e.g. in a new sector) must account for performance below optimal



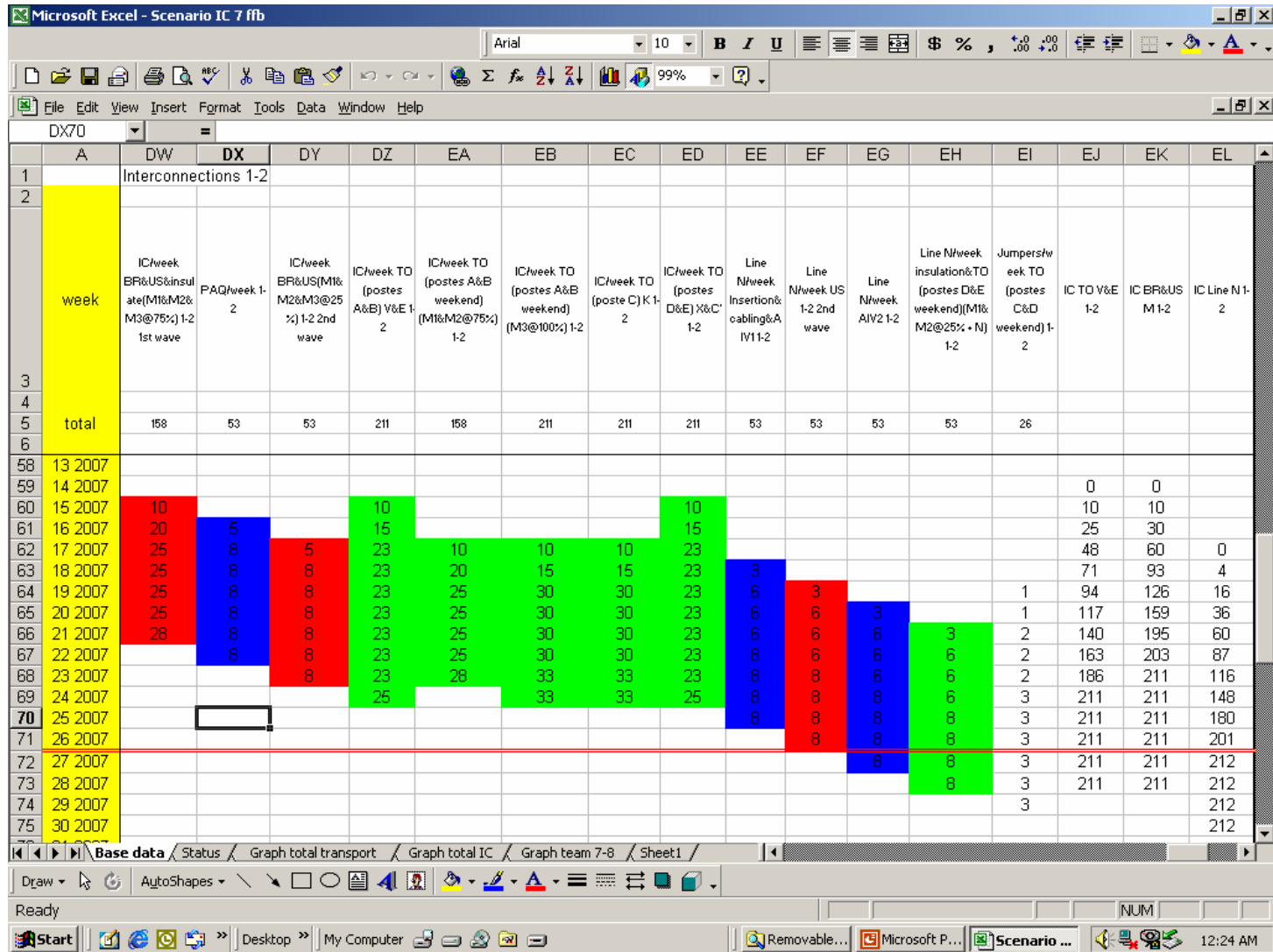
Overall scenario (previously...)



- Request: need to gain 20 weeks in 2007
- but no early start in 6-7 is possible AND coactivity with transport Friday and Saturday
- AGAIN: make maximum use of transport via 8-1&7-8 to 5-6&6-7
> AVOID the coactivity trap



...trying to square the circle ...



...nightmare ...

Microsoft Excel - Scenario IC 7 ffb

EM1 = Total workload only 2-3 and 1-2 alone (8-10 activities/week-team)

	A	EM	EN	EO	EP	EQ	ER	ES	ET	EU	EV	EW	EX	EY
1		Total workload only 2-3 and 1-2 alone (8-10 activities/week-team)												
2														
3	week	activity/week BR(M1&M2&M3)	activity/week US(M1&M2 · N)	activity/week TO(V&E)	activity/week TO(M1&M2&M3)	activity/week TO(K) includes jumper	activity/week TO(X&C') includes N and jumper	activity/week TO total						
4														
5	total	422	666	422	422	422	422							
6														
56	11 2007	0	0	0	0	0	0	0						
57	12 2007	10	10	10	0	0	10	20						
58	13 2007	20	20	15	0	0	15	30						
59	14 2007	30	30	23	10	10	23	66						
60	15 2007	43	43	33	18	15	33	99						
61	16 2007	53	53	38	28	38	38	134						
62	17 2007	65	77	46	38	40	46	170						
63	18 2007	69	83	46	47	45	46	184						
64	19 2007	41	62	46	58	60	46	210						
65	20 2007	41	73	46	61	63	46	216						
66	21 2007	36	68	48	49	63	48	208						
67	22 2007	8	40	23	35	30	23	111						
68	23 2007	8	45	23	38	33	23	117						
69	24 2007	0	18	25	24	33	25	107						
70	25 2007	0	18	0	8	0	0	8						
71	26 2007	0	18	0	4	0	0	4						
72	27 2007	0	0	0	4	0	0	4						
73	28 2007			0	4			4						

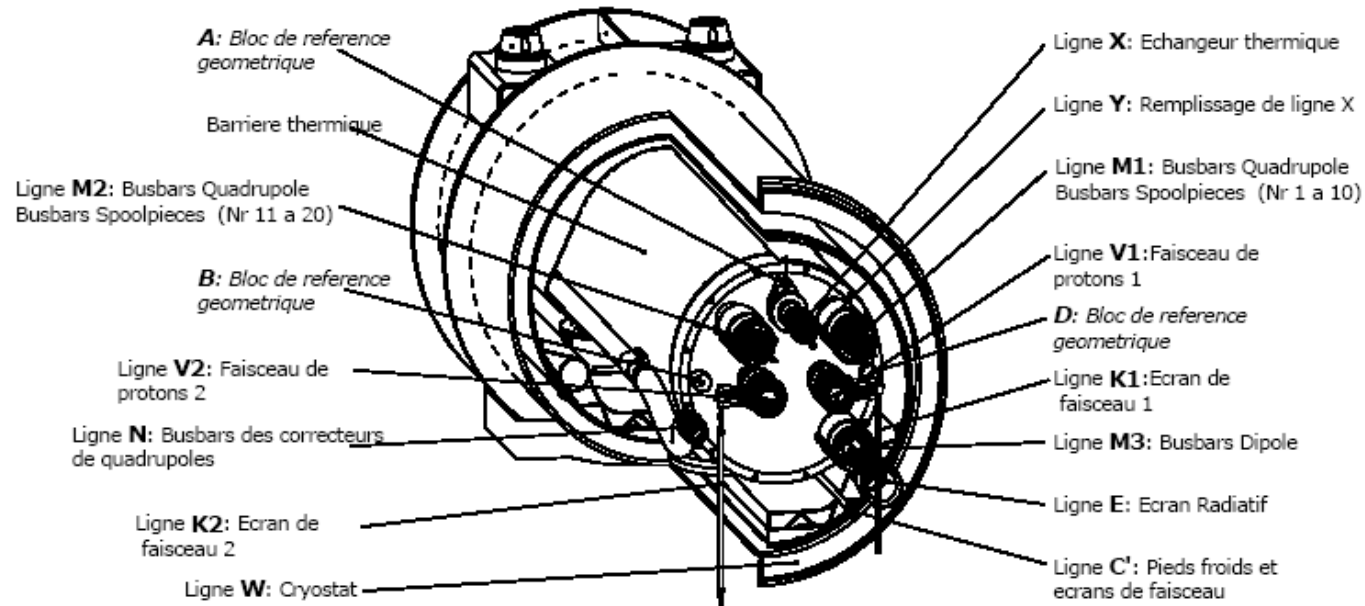
- fast startup implies experienced teams;
- but there are huge weekly fluctuations in team resource needs;
- too many teams together in the tunnel (safety and productivity)
- early BR&US start (with good productivity) is incompatible with missing SSS (3&4, 4&5, 5&6)
- ...

... so what do we do?

- we should be discussing “passage au forfait” with IEG: this requires stable, credible conditions
- similarly we are pushing ourselves and IEG for fast progress in 7-8&8-1: this is absorbing resources and attention
- other activities are absorbing further attention and resources: CRI needs internal CERN help urgently
- today I see no plan remotely feasible compatible with “closing last line-N and jumpers” by end June 2007
- I will continue to look for planning solutions
- I will focus on actions that keep our options open (e.g. timely ordering of equipment potentially needed in 2007)
- Coactivity with transport: ultimately a conflict between “objective: beam test by end 2006” and “objective: machine ready for cooldown by August 2007”

Definition of lines

EXTREMITE DOWNSTREAM D'AIMANT DIPOLE LIGNES D'INTERCONNEXION



From A. Jacquemod